THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIII. No. 1351.] LONDON, APRIL 2, 1889. [41ST YEAR. Price 6d.

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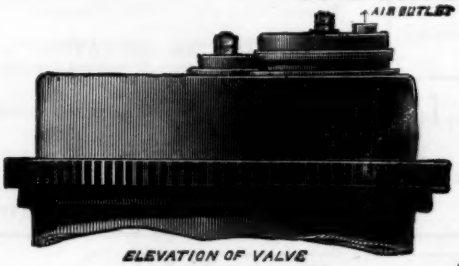
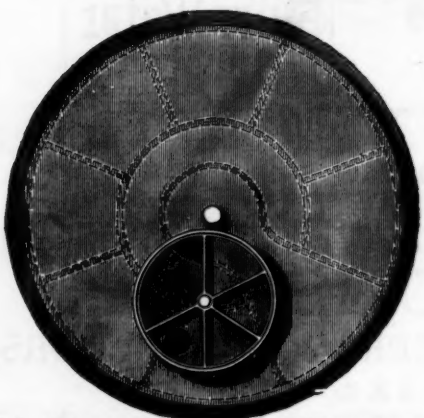


ELEVATION OF VALVE



PLAN OF TOP OF CENTRE VALVE FOR FOUR PURIFIERS

Wood Grids for Purifiers. / Wood Boards for Scrubbers. / Cast-Iron Main Pipes and Connections. / Station Meters. / Governors. / Valves of every description. / Brass Fittings. / Lamp Columns. / Boilers. / Weighbridges. / &c., &c.

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The illustration shows one of our new Patent Air-Clearing Valves as fixed on the Cover of a Centre-Valve. When in action, the clean gas from the Outlet Chamber of the Valve is passed down the Outlet-Box of the Purifier last changed, and forced through the Inlet into the Air-Clearing Valve, from which a proper outlet is provided on the top, leaving the Purifier ready charged with clean gas in place of air, as is usual; thus preventing the spoiling or wasting of a large quantity of gas.

Many of these Valves have been fixed, and are giving every satisfaction.

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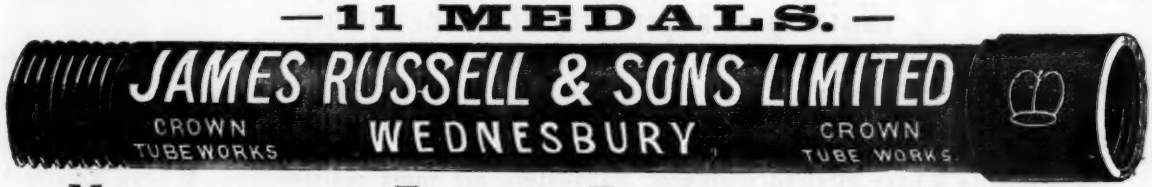

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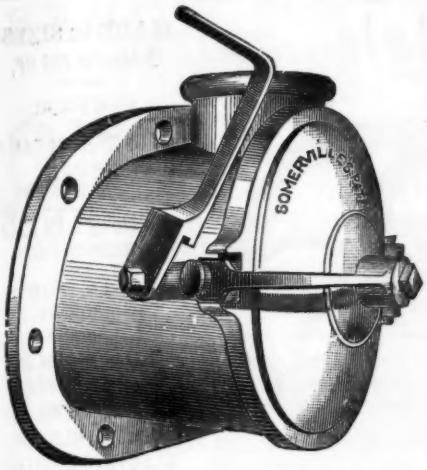

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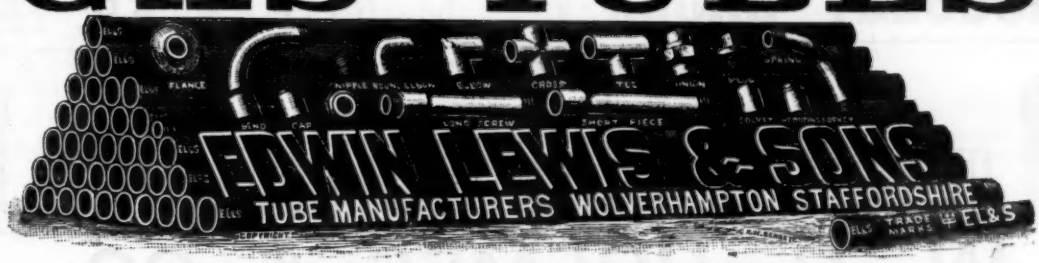

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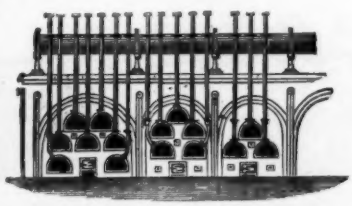

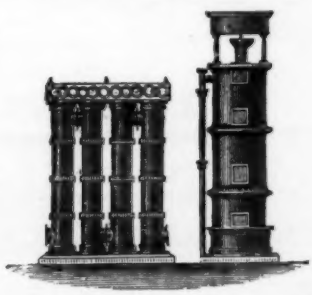

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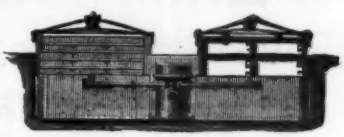

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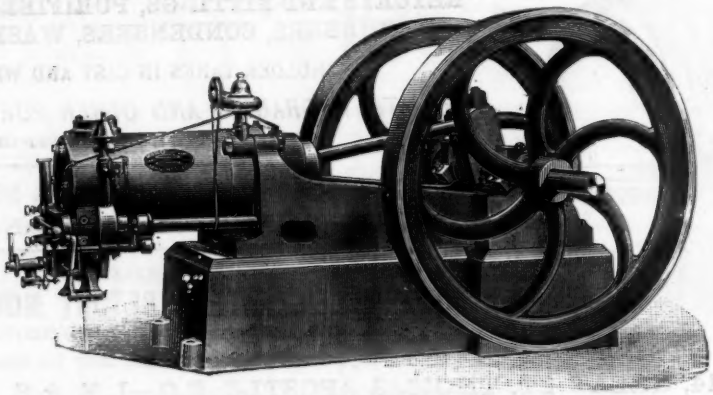

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DYNAMOS, &c., &c.

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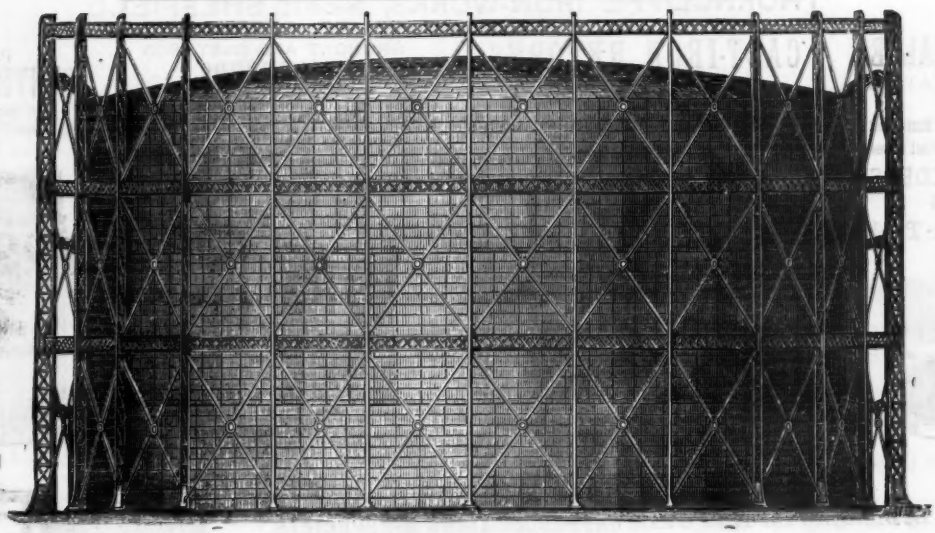

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FOR

GAS PURIFICATION

AND THE

EXTRACTION OF AMMONIA FROM GASES

FROM COKE-OVENS AND BLAST-FURNACES.

AT THE PRESENT DATE

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ARE

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The Gaslight and Coke Company,

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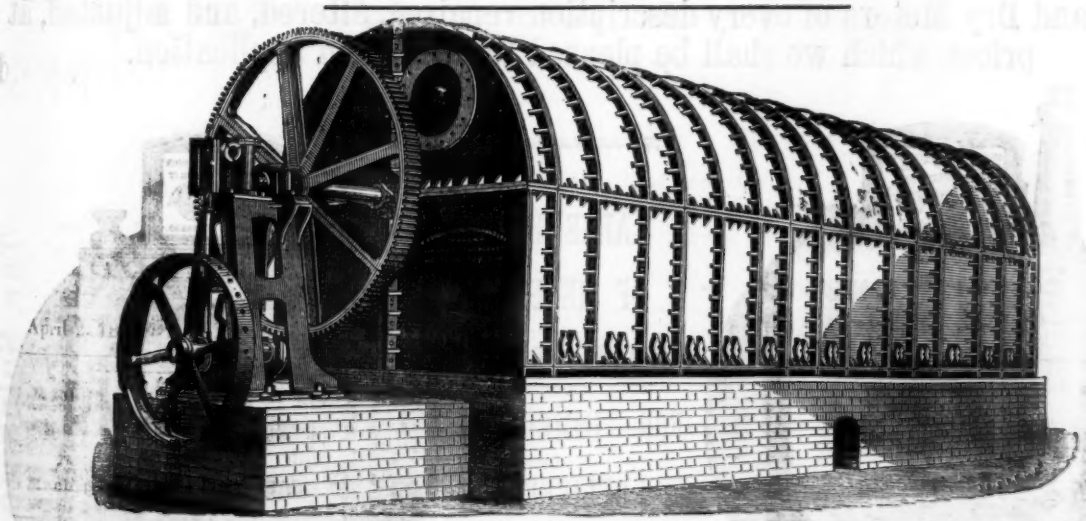
(Signed) G. C. TREWBY.

Testimonials as to Efficiency are too numerous for publication, but can be had on application at the Company's Offices.



This engraving represents one of the four "Standards," for 8,000,000 feet each, erected for the Corporation of Leeds, and now in use at the New Wortley Station;

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Hand Gear. (*From Photos of the ¾ cwt. size.* Foot Gear.

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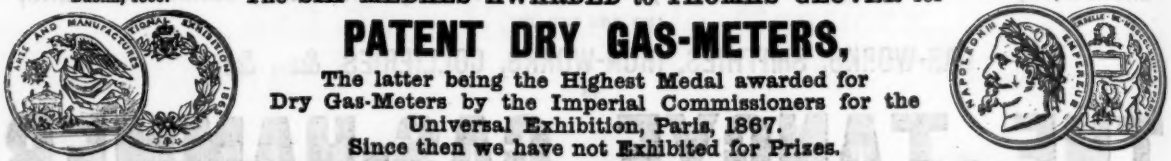

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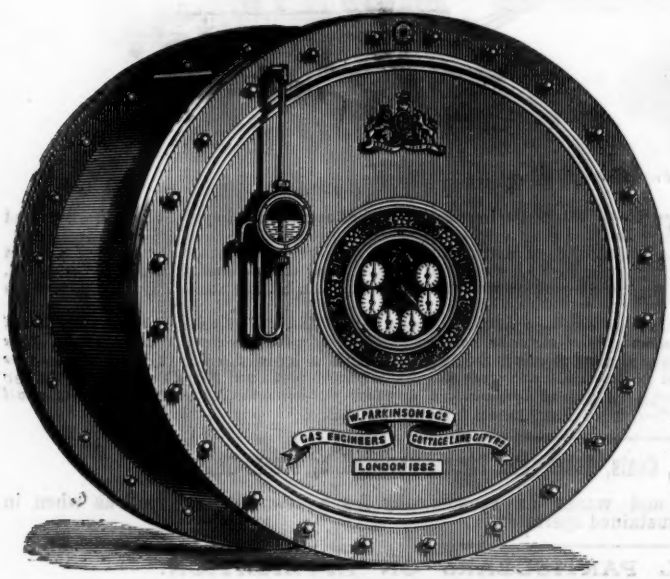

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FITTED WITH PATENT

THREE-PARTITION DRUMS

MORE THAN

250 STATION METERS,

Varying in size from 1200 to 200,000 cubic feet per hour, have been sold, fitted with

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Since their introduction three years since.

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PRICES VERY MODERATE.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 2, 1889.

A BOLD ADVERTISEMENT.

LAST Friday the newspapers came out with a huge advertisement of the British Water Gas Syndicate, Limited, giving a report by Sir Douglas Fox on the working of the water-gas process at the works of the Leeds Forge Company, together with a collection of extracts reprinted from various newspapers relative to the general subject of the manufacture and application of water gas. This particular Syndicate is not a new speculation, as it has been before the public for some time. There was therefore no apparent reason for the spending of so much money in these advertisements just now, unless the Syndicate meant to seek an increase of capital or contemplated the formation of subsidiary Companies. Tha something of this kind must be "in the wind," to warrant such a liberal spread of ground-bait, was the natural thought of newspaper readers on Friday. We are not for the moment concerned so much with this expectation—realized in the appearance next day of an appeal for £300,000—as with the immediate subject of the advertisement. It begins with a brief note, signed by Sir Douglas Fox, introducing to the Syndicate his report on the Leeds Forge experiment, in which he states that "water gas has a great future for manu- "facturing, heating, and lighting purposes, and that it can "be produced at a cost, at present prices, of about 4d. per "1000 cubic feet. It must, under many conditions, prove a "formidable rival to ordinary coal gas." This is the matter we have to deal with; and the only difficulty is to decide where to begin—whether with the general subject of water gas and its applications and value, or with the particular experiment with which the Syndicate is identified.

We have long foreseen this revival of water gas projects in this country. In the JOURNAL for Oct. 9 last appeared an account of the water-gas plant adopted by Mr. Samson Fox, of the Leeds Forge Company, as the result of his inspection of the working of a similar process in America; and the subject has been industriously kept before the public ever since. We are not aware that it has been anywhere acknowledged—the advertisements now under notice may be searched through in vain for such a purpose—but, as a matter of fact, the process adopted by Mr. Fox is apparently exactly similar to that well known in the United States under the name of its owner, Mr. Burdett Loomis, and occasionally referred to in these columns. We cannot imagine that Mr. Fox wishes to add to his reputation by allowing it to be understood that he is the inventor or designer of a process of which he is merely the importer; but it is rather remarkable that in all the newspaper extracts quoted in the advertisement of the Syndicate, the name of Fox and no other appears in connection with the experiment. All these newspaper opinions, by the way, are as absolutely worthless as usual. When the promoters of a scheme of this character, in which an old idea is made to look like something new, wish to attract the attention of the public, they are naturally careful not to place themselves at the mercy of journalists who really know something about it, and are likely to tell the truth. They incline to journals they can "inspire." Thus, for example, they induced *The Times* to state that water gas had never been successfully used before Mr. Samson Fox took up the idea; and the same delusion is propagated by the *Financial Times*, the *Globe*, the *British Architect*, and even the *Engineer*, which last might have been expected to know better. Most of these journals, with some others of less repute, figure in Friday's advertisement. The rest of this production apparently consists of Sir Douglas Fox's report, which with some reliable statements mixes a great deal of rubbish. One is disposed to ask, for example, whether it was necessary for the Water Gas Syndicate to go to Sir Douglas Fox to learn that "water, the great fire sub- "duer, consists of hydrogen—the most inflammable, and burn- "ing with the most intense heat, of all gases—and oxygen, "the sole supporter of combustion." Passages like this, plentifully sprinkled as they are through the report, show that it was prepared for popular consumption rather than for the guidance of the Syndicate. Sir Douglas Fox admits, however, that water gas is used at several iron-works on the Continent, "and "in over 300 cities and towns of the United States of "America," which, to say nothing of the accuracy of the figures, reads strangely after the innocent confessions of the newspapers to the effect that they never heard of it before Mr. Samson Fox adopted it for the Leeds Forge works.

Indeed, the closer the terms of this daring bid for popular confidence are examined, the more hollow they appear. The Syndicate seem now to have dropped the ingenious Mr. W. L. Wildy, whose injudicious advocacy of water gas on behalf of the Syndicate formed the subject of comment in these columns on Dec. 11 last; but they have done very little in all their costly advertisement to prove Sir Douglas Fox's assertion that water gas is capable of rivalling coal gas in this country, excepting perhaps a few very special applications. Even if it is to be conceded that Sir Douglas Fox, writing to order, is as safe a guide as Mr. R. Dempster, whose impartial report upon the cost of water gas in America appears on page 289 of the current volume of the JOURNAL, and accordingly that the cost of uncarburetted water gas is to be taken at 4d. instead of 11d. or 1s. per 1000 cubic feet, it remains to be seen what interest this particular Syndicate

have in the result. There are a dozen tried systems of water-gas making equally good, which can be adopted by any English manufacturer in competition with theirs. It may please Mr. Samson Fox to pose as the first and only successful maker of water gas in England; but the attempt to set up a monopoly in this business is absurd.

So much for Friday's ground-baiting. Next day came out a prospectus, asking the public for £300,000 of capital, as already stated, on the assumption that water-gas is a proved "commercial success." For the first time we observe in this prospectus the names of Mr. Alfred Wilson and Mr. Bernard Dawson associated as water-gas patentees and specialists with Mr. Samson Fox. It is not stated how much Mr. Fox is to get; but Messrs. Wilson and Dawson are to be paid £217,250 in cash and shares for their producer patents and business interests! This is to be a "parent Company," and principally devoted to breeding subsidiary concerns; but we can only repeat, with regard to the prospects of these promised subsidiary Companies, what we have already said of the parent. There is no monopoly in water-gas plant or processes; and even if it is true that there is anything in the idea, there is no reason why a manufacturer should contribute the slightest support to Mr. Samson Fox's Company.

THE ALTERED INSTRUCTIONS OF THE GAS REFEREES.

In another column will be found an extract from the Notification of the Metropolitan Gas Referees for the summer season; and it will be seen therefrom that important alterations are introduced into the directions for testing gas for illuminating power, and also for testing the meter. This notification may be taken in effect as the reply of the Referees to the recent agitation raised by the Gas Companies with respect to the treatment to which their gas is subjected by the Examiners. The remarkable thing is that these gentlemen are punished by the orders for the shortcomings of the system which they have to administer. Thus, for instance, under the old regulations, which have been in force for years, it was merely directed that the tests for illuminating power should be "three in number daily;" but no interval between the tests was prescribed. By the new order, the three daily tests are to be "taken at intervals of not less than one hour; but if "one of these testings assigns to the gas an illuminating "power differing by more than one candle from the "illuminating power assigned to the gas by another "testing, or if the average of three testings of illuminating "power fall below the prescribed illuminating power, a "fourth testing shall be made after a further interval of one "hour." This means, to begin with, that all the Gas Examiners must attend at their stations at least twice as long daily as they have been accustomed to find necessary for the most scrupulous discharge of their duties under the old regulations; and if they have any spirit at all, they will demand a substantial increase of salary in consequence. The Gas Companies have no reason to complain of this order, especially as the Examiner who is unfortunate enough to find the gas low in illuminating power is to be "kept in," like a naughty boy, for another hour on this account. Precautions are to be taken against the discs becoming dirty; and three different sets of candles are to be used for the three regulation testings. The directions for the manipulation of the candles are made much more particular and minute. In all this there is nothing to object to; but the Instructions conclude with the very peculiar caution that "no testing is to be "rejected on the ground that the result seems improbable." That is to say, that no personal error of observation or unexplained miscarriage of the apparatus, however absurd on the face of it, is to be permitted to be struck out of the record. Truly, what with inquiries before the Chief Gas Examiner and days at the Police Courts, the lot of the poor Metropolitan Gas Examiners is "not a happy one." They may be forgiven for thinking that it is all very well for the well-paid and not over-worked Referees to elaborate their Instructions in this manner, but that if these high and mighty gentlemen had the daily work of carrying out their own orders they would soon cry out for relief.

THE COMMERCIAL COMPANY'S REPORT AND ACCOUNTS.

The report of the Directors and the accounts of the Commercial Gas Company for the half year ending Dec. 31 last have been issued, in view of the ordinary general meeting next Friday. The revenue account shows a net profit for the half year of £57,034, making, with £1219 received for interest, a profit balance of £58,254. This, added to the amount brought forward from previous accounts, makes a sum of £108,020, from which £2727 has to be deducted for interest on debenture stock, leaving a balance of £105,292 to the credit of the net revenue account, out of which £44,800 is available for dividend. These figures show a substantial advance upon the returns for the same period a twelvemonth earlier, when the balance of profit on revenue account was £46,232. Accordingly, the Directors are able to recommend the payment of dividends at the rates of 13¾ and 10¾ per cent. per annum upon the old and new stocks of the Company respectively, and even then carry forward £60,492 to the next half year. Moreover, they have resolved to reduce the price of gas from 2s. 6d. to 2s. 4d. per 1000 cubic feet as from the Lady-day quarter. Unmistakeably, Gas Companies are again in the highway of money-making. Last half year the Company received £119,488 for gas, as compared with £112,802 a year before; and residuals advanced from £34,936 to £41,816. Their working expenses only rose from £104,493 to £107,318; while their gross revenue increased from £150,725 to £164,352. The sale of gas developed from 883,888,000 cubic feet to 940,562,000, or by 6·4 per cent.—a most gratifying increase. The only other point that need be noticed in the detailed statements of account is that the Company still carbonize a comparatively high proportion of cannel. The report mentions in appropriate terms the death of the late Chairman, Mr. Richard Bradshaw. The Directors intend to propose an increase in the remuneration of the Secretary, Mr. H. D. Ellis, which is eminently deserved.

MR. HACK VINDICATED.

It is with satisfaction, in which the element of surprise does not occur, that we record the result of the investigation by the Gas Committee of the Birmingham Corporation of the charges against Mr. Henry Hack. The recommendation of the Committee for an increase of Mr. Hack's salary was made the occasion, by a small but noisy group of the Council who misrepresent the labour interest, for an onslaught upon Mr. Hack's character as Manager of the Saltley workmen. Anyone who knows how personal grievances are manipulated by persons of a certain stamp, can imagine what a turmoil has been created in Birmingham round and about the question whether Mr. Hack is or is not just and considerate in his dealings with the workmen under his control. The inquiry into this question is admitted by the local press to have been exhaustive; and the description is fairly merited, seeing that 64 witnesses were examined. The allegations preferred against Mr. Hack were both general and specific. It was said that there is no manufactory in Birmingham where a greater ill-feeling existed between a manager and his men than at Saltley; that men had left the works in gangs in consequence of the treatment they had received; that wages had been reduced; that the hours of work were excessive; and various other accusations of the same nature were published, the effect of which, if proved, would have been to exhibit Mr. Hack as unworthy to retain his position for a single day longer. The result of the investigation, however, is the triumphal vindication of the accused. No evidence at all was brought forward in support of some of the counts in the indictment; others were found to rest upon the flimsiest pretences—generally of accidental origin; and on the general question of "tyranny" the report of the Committee specially exonerates Mr. Hack. The alleged ill-feeling on the part of the men towards Mr. Hack was found to be non-existent; and the whole thing turns out to be a piece of meddlesomeness on the part of a couple of town councillors. The report credits these individuals with believing their own charges when they made them; but declares that "it was obvious all "through the inquiry that the information with which they "had been supplied had been given with insufficient know-"ledge of the facts, and with a certain amount of high "colour, which disappeared when subjected to careful exami-"nation." Mr. Hack has no reason to complain of the holding of the inquiry, which has turned out so satisfactory to himself. If any harm has been done, it is to the Corporation, by teaching the workmen how disciplinary measures may be resisted by calling in the ward politician. If the persons who thus slandered Mr. Hack had been other than ratepayers' representatives, their willingness to make charges of the gravest nature against a professional man and a public officer upon the merest hearsay evidence, or no evidence at all, would have been susceptible of but one interpretation, and their assertions would be described in one short and vigorous word. Being town councillors, of course they may do anything in the name of their "party." We cannot conclude this notice of the affair without offering congratulatoins to

Mr. Hack and his assistants, implicated with him in these accusations, upon their complete acquittal, and restoration to that place in the esteem of the Corporation and the inhabitants of the town from which their enemies conspired to eject them.

SECOND READING OF LORD R. CHURCHILL'S BILL.

Lord Randolph Churchill's Bill for penalizing corruption on the part of officers and members of public bodies was read a second time in the House of Commons on Monday last week. It was not discussed at any great length; the chief points made against its provisions having reference to its restriction to public bodies, who, as was remarked, are quite as well able as private bodies to defend themselves by ordinary means. There is much force in the remark that legislation should be directed to checking and punishing crime wherever found and by whomsoever committed, and that to discriminate between offenders is bad in principle. Captain Bethell and Mr. Brunner joined in wishing that the scope of the Bill could be extended to embrace private business transactions, so as to put a stop to the system of "tips" wherever found; but Lord R. Churchill said that he feared if the measure were made too wide, it would come to nothing. Of course, all the speakers in the debate agreed as to the desirability of rendering the payment and acceptance of commissions illegal; but it was a question whether Parliament should take the whole subject in hand now, or wait to complete the work at some future time. We do not quite understand why, while Lord R. Churchill was about it, he could not have done the whole work under one measure; for surely it may be thought that a Parliamentary Committee could have found time to settle just the one additional clause of the Bill which would have rendered it complete. As it stands, the Bill looks what it is—an offspring of the Commission of Inquiry into the administration of the Metropolitan Board of Works; and all legislation *ad hoc* has a one-sided aspect. It is to be feared that now the pressure of public opinion upon this subject has been allowed to expend itself upon the single attempt to check corruption among people connected with Local Authorities, such another opportunity for securing a general strengthening of the law in this respect—so as to include not merely public officials but all agents occupying an intermediate position between buyer and seller—may not be found again. It would be a great pity if the cause of commercial purity were to be relegated for ever to that hopeless category of objects in regard to which parliamentary action is generally desired, but for which a fitting occasion never comes. It is to be hoped that when the Bill becomes law it may exert a collateral influence upon business; but this will not remove the anomaly that a gas or water works official will be able, so long as the undertaking with which he is connected remains in private ownership, to do with impunity things which in the event of a transfer of the property to a public authority would render him, for no real accession of guilt, liable to fine, imprisonment, and civil disabilities.

On the site formerly occupied by the Holborn Amphitheatre (subsequently converted into the Connaught, and later into the Holborn Theatre), nearly opposite the Inns of Court Hotel, there has been erected by Mr. W. T. Purkiss, from designs by Mr. R. E. Tyler, F.R.I.B.A., a spacious building, which will be opened to the public next Thursday, on the occasion of the Sportsman's Exhibition, under the name of the Central Hall. The event calls for notice in our columns from the fact that the proprietor claims it to be the best lighted and ventilated hall in the Metropolis; both these important matters having received special attention. After much consideration, it was decided to employ gas as the lighting agent; and the Wenham system was selected as the medium. The building comprises a grand hall, 170 feet long, 50 feet high to the centre of the roof, and 90 feet wide, round which there is a balcony, 26 feet wide, supported on iron pillars. In the rear is a smaller hall, 80 feet long by 31 feet wide; and on the western side are dining-rooms and kitchens. The central hall is lighted by three decorative clusters, each consisting of ten of the Company's No. 3 lamps, suspended from the roof; in addition to which there are 24 lamps over the balcony, and a similar number hanging underneath. In the minor hall there are three 5-light clusters; in the principal dining-room, two similar clusters; and in the refreshment-room (on the north side of the great hall), three single large-sized lamps. The vestibule is lighted by three ordinary lamps, in addition to a beautiful cluster of 19 small lamps in the entrance. The quantity of light emitted by the lamps is ample for the thorough illumination of every part of the hall; perfect diffusion being ensured by their judicious arrangement. There is brilliancy without glare. The lamps were supplied by the Wenham Company; the gas arrangements being carried out by Messrs. Hulett and Co., of Holborn.

Water and Sanitary Affairs.

The Old Ford reservoirs and pumping station of the East London Water Company, now about to be disposed of to the Midland Railway Company, have filled a prominent place in the history of London Water Supply. The records concerning these works carry us back to the early years of the present century. In furtherance of the powers obtained by their Special Act of 1807, the East London Company began by constructing at Old Ford settling reservoirs, having an area of about 11 acres; and the construction of other works speedily followed. In 1829, however, the Company purchased the Hackney Water-Works; and in the same year they obtained authority from Parliament for the removal of the intake from Old Ford to Lea Bridge. Those were the days of sleepiness and lethargy in regard to sanitary science—a condition from which the Water Companies and the public were not fully aroused until outbreaks of cholera enforced attention to the close relation which exists between water supply and disease. Prior to 1865, the East London Company had abandoned the regular use of the Old Ford open reservoirs; but it was to the casual use of unfiltered water from one of these that, step by step, some of the devastating effects of the cholera epidemic in 1866 were conclusively traced. Old Ford, which, owing to the pollution of the River Lea, had already acquired a bad name, thereupon became, and deservedly became, even more odious in the estimation of water consumers. By the terms of an Act passed in 1867, the Company were placed under obligation to discontinue the use of, and to fill up, the open reservoirs in this district, and also to abandon the use of the open canal which connected the reservoirs with the works at Lea Bridge. The Company's modern covered reservoir has, however, been in continuous use. Into this reservoir the filtered water from Lea Bridge has been conveyed through 4-feet cast-iron pipes, and pumped into the adjoining districts. The same reservoir received the water obtained from the well and bore-hole in the chalk, which the Company's Engineers sunk to a depth of upwards of 450 feet from the surface. It may interest some of our readers if we mention that it was at Old Ford that the first Cornish pumping-engine was erected in London. The saving effected by the Cornish, as compared with the results shown by engines of the older fashion, caused at the time the greatest astonishment and satisfaction. All this belongs to the past. The Old Ford works have served their purpose; and doubtless the shareholders of the East London Company, who hold their meeting to-day, will see no reason to quarrel with the negotiations for a sale of the lands and works, nor with the price which the Midland Railway Company are to pay for the property. Apart from other considerations, the Directors express the belief that the concentration of the main pumping operations at Lea Bridge will prove of great value in promoting increased efficiency and economy in working the undertaking.

It is satisfactory to find that progress is being made with Mr. W. Webster's electrical method for the purification of sewage. The experimental works erected by the inventor at his own cost, at the southern outfall of the London main drainage at Crossness, were visited on Wednesday last by representatives of the public press, and particulars are now available which throw fresh light on what is inherently a very intricate problem. During a period of thirty years, many schemes have appeared which at first were big with promise for a final settlement of the sewage question. Yet to this hour judgment remains in suspense, although the late Metropolitan Board were so convinced as to the excellence of the plan proposed by Mr. Dibdin, in conjunction with Dr. Dupré, as to order the execution of works which by the time they are complete will cost nearly a million, including the sludge ships. But in relation to the country at large, it has to be observed that the treatment which effects a sufficient purification of the sewage entering the Thames at Barking and Crossness, is not necessarily adequate in the case of a river composed wholly of fresh water used for various manufacturing purposes, and connected with a domestic supply. Mr. Webster presents his electric method as adequate for all purposes. He can carry purification to any extent, even so as to convert sewage into a powerfully disinfectant fluid, the very opposite in its properties from the noxious compound in which its elements existed. Or he can stop short of this perfection, and graduate the process so as to give the exact degree of purity required. Neither does the process take a long time.

A run through a shoot containing a number of iron plates connected with a dynamo, and an hour or two of quiet deposit in a settling-tank, are all that is required. Wednesday was a cool and breezy day, but still it was remarkable that not the faintest odour of sewage was perceptible from the open shoot or from the tanks. In this respect there was a decided contrast to experience gained with open carriers on sewage irrigation farms. The effect of the electric force first made itself apparent in the flocculent aspect of the sewage, as it flowed on its way to the tank. It was evident that the constituents of the sewage were undergoing a rearrangement, preparing them for final deposition. The flow was understood to be at the rate of 12,000 gallons per hour; but the works were capable of dealing with twice this quantity. A tabular statement was laid before the visitors, showing the average result of twenty analyses, by which it appeared that raw sewage of a very turbid sort, after treatment by the electrical method, yielded a clear and odourless effluent, with a very large reduction of the suspended matters, and a material diminution in the soluble. Reckoned in parts per 100,000, the matters in suspension were reduced from 33·35 to 1·56; while the free ammonia declined from 4·34 to 3·22, and the albuminoid matter from 0·5 to 0·2.

But the experimental sewage works at Crossness were set on foot chiefly for the purpose of ascertaining the cost at which the process could be carried out. This object has been so far accomplished that little doubt remains as to the working cost. The waste of iron in the electrodes is two grains, or less, per gallon of sewage; and 27-horse power is sufficient for a million gallons in 24 hours. Wages are but a small item; and altogether the working cost is stated to be 13s. per million gallons, which for the entire volume of the London sewage, reckoned at 150 million gallons per day, would amount to £36,000 per annum. The remaining part of the financial question relates to the capital charges, concerning which the data are not so complete. An estimate was given on Wednesday, which, although of an encouraging nature, Mr. Webster has since declared to be in excess of the probable amount. Including engines and dynamos, but irrespective of settling-tanks and the removal of sludge, he reckons interest on capital and depreciation of plant, together with repairs, as amounting to about £5000 per annum; making therefore, when added to the working cost, a total of £41,000 per annum. The sludge under this process is as compact as it well can be; the only foreign matter being that furnished by a maximum of two grains of iron per gallon, somewhat augmented by being converted into an oxide. The tank requirement is also moderate; and all machinery for the mixing of chemicals is avoided. So the matter stands at present; and it is to be hoped that the question will soon be carried a step further, so as to enable the County Council to decide between the merits of this plan and the one which the Metropolitan Board had previously decided to adopt. The Board, it has to be remembered, had to decide on the chemical plan before the electric method of treating the sewage was presented to their notice.

Messrs. George Glover and Co. have obtained the highest award—"First Order of Merit, with special mention for general excellence"—for their dry gas-meters shown at the Melbourne Exhibition.

Under the auspices of the South Metropolitan Gas Company, Madame Alting-Mees delivered a very successful course of lectures on cookery at Herne Hill last week, and is now engaged in similar work at Blackheath.

Mr. R. Porter, the Manager of the Holmfirth Gas Company, has been appointed, out of 58 applicants, to fill the post of Manager and Secretary of the Elland Gas Company, rendered vacant by the removal of Mr. Pike to Colchester.

By the death of the Duke of Buckingham and Chandos, which occurred rather suddenly last Tuesday night, in his 66th year, the House of Lords lost their Chairman of Committees. His Lordship was discharging the duties of his office up to the previous Thursday, on which day he was confined to his house by indisposition, which necessitated the postponement of the consideration of a number of unopposed Bills. His illness unfortunately took an unfavourable turn; and his Lordship succumbed to it on the above-named day. Our readers may remember that the late Duke was chosen Chairman of Committees of the House of Lords on the death of Lord Redesdale in 1886; and he possessed to a certain extent the brusqueness which characterized his predecessor. He was nominated for the office by Lord Salisbury, who, in alluding to his sudden removal in the House of Lords last Thursday night, referred to the strict impartiality, uprightness, and diligence with which he had discharged his duties.

Essays, Commentaries, and Reviews.

THE AFFAIRS OF THE GAS INSTITUTE.

The invitation to a meeting at the Hôtel Métropole last Saturday, sent by Mr. Alfred Colson to the members of the Provisional Committee of the new movement for the establishment of a National and Representative Organization for the Gas Industry, met with a highly satisfactory response. A numerous and thoroughly representative gathering of gas engineers and managers from all parts of the country was the result; and the business transacted was of a nature to well repay the trouble of those who were public-spirited enough to attend. The meeting being strictly private, no reporters or strangers were admitted; but a special note was taken of the proceedings, for future reference. The object of the gathering was primarily to discuss the state of affairs leading to the formation of the Committee, and to decide upon future action. Mr. W. Foulis was called to the chair; and we understand that full and free discussion went on for about two hours, ending in the formal confirmation of the general resolution to which the members of the Committee had already subscribed. A Sub-Committee, consisting of the following seven gentlemen—Messrs. Foulis, Trewby, Hunt, Chapman, North, H. Woodall, and Colson—was appointed to advise as to the manner of carrying the resolution into effect, including the drafting of the rules of a new Institute; and this Sub-Committee will call the general body together to receive their report whenever they think fit after the June meeting of The Gas Institute. From this statement of the results of Saturday's meeting, it is to be understood that no new Institute has yet been definitely formed. A practical step has been taken in the direction of preparing for this eventuality, which the meeting agreed must be the inevitable outcome of the troubles of The Gas Institute; but the members of the Provisional Committee wisely deferred the irrevocable action until after The Gas Institute meeting, in order to avoid the appearance of wishing to precipitate matters, or to divide the industry, until the members of the Institute have had the opportunity of speaking. This policy we regard as exactly right for the occasion. The Provisional Committee remains provisional; and it will do nothing to prejudice any action which the Council of The Gas Institute may think fit to take. After the latter have given their answer to that plea for reform of which they allow the justice and force, and have made their report to their constituents, gas engineers and managers who admit the advantages of mutual association will be free to decide as to where their allegiance may best be placed—with the old organization or the new.

It is understood that the Council of The Gas Institute are now holding frequent meetings, and have prepared another draft circular relating to the amendment of rules, which, although not yet generally distributed, is having a wider confidential circulation than the first.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 634.)

The reaction from a period of depression which we noted in our last issue as being apparent, was clearly established in the course of the past week, when everything took a turn for the better. The improvement was well maintained until almost the close; but the last prices were not the best in all departments. The Gas market has also shown a good upward tendency, as exemplified in the chief issues; though one or two of the smaller mark a slight retrogression, owing to special causes. Foremost comes Gaslight "A," which has been active and strong, advancing day by day from 256½, the opening price, to 261 at the end of the week. The quotation comes out 3½ better. Moderate business was also done in the secured issues of the same Company, at average figures. Next in point of size is Imperial Continental, which started at 210½, and advanced to 212½, at which price transactions were repeatedly marked. Then South Metropolitan "B," commencing at 240, steadily progressed; and at the close the quotation showed an improvement of 2½. The Company's other issues were hardly touched, and have made no change. Commercials have again been absolutely stagnant. The Company's accounts for the last half of 1888 are now out, and amply justify the remarks we some time ago made, that last year would prove to have been an excellent one for the Metropolitan Gas Companies. At their general meeting next Friday, the Chairman should have a happy time of it, with an array of radiant faces on the other side of the table. Concerning the Suburban and Provincial Companies, there is next to nothing to be said. They may be written as quiet and unchanged. Among the Foreign undertakings, Continental Union and European have suffered a slight relapse; but the rest stand pretty firm. Dealings in Water have been more limited, and the tone of the market is less strong—affected perhaps to some extent by the recent debate in the London County Council. Chelsea is placed 2 lower; and New River sellers have reduced 5.

The daily operations were: Moderate business in Gas on Monday, well distributed through the list. Prices generally were fairly good; but European new fell ½. A few transactions in Water were marked at about middle figures. Tuesday's Gas business was nearly all in Gaslight "A" and Imperial Continental, for the next account; and though the prices were high, the quotations were left standing. Water was weaker—especially Chelsea; but here again there was no change of quotation. On Wednesday, Gas was a little more active and strong. Gaslight "A" rose 1½;

but European new fell another ½. In Water, Chelsea and New River made the fall noted above; but nothing was done in them. Thursday was the busiest day of the week, especially in the big Gas issues. South Metropolitan "B" advanced 2½, and Gaslight "A" ½; and, upon *ex div.* changes, British, Crystal Palace, and Ottoman were slightly improved. There was nothing to note in Water. Gas generally was much quieter on Friday; though Gaslight "A" continued in good demand, and rose 1½ higher. Continental Union, £14 paid, fell 1. Moderate business and moderate prices characterized Water. On Saturday, Gas was unusually brisk, and prices were still on the rise. Imperial Continental advanced 1; and Continental Union recovered half of its previous day's loss. Water was dull and unchanged.

ELECTRIC LIGHTING MEMORANDA.

THE LONDON COUNTY COUNCIL AND ELECTRIC LIGHTING ORDERS—GENERAL HICKENLOOPER ON ELECTRIC LIGHTING BY GAS COMPANIES—AN ELECTRIC LIGHT ADVERTISEMENT AT CHELMSFORD.

An important letter, the text of which is given elsewhere, has been sent from the Board of Trade to the Chairman of the London County Council, upon the subject of the pending applications for Provisional Orders for the supply of electricity to different parts of the Metropolis under the Electric Lighting Acts, 1882 and 1888. There are thirteen such applications now before the Board; and the questions raised by them are engaging the serious consideration of the Department—more especially as regards the extent of the areas to be granted to the applicants, and the conferring of concurrent powers to two or more suppliers within the same area. The communication goes on to briefly set out some of the considerations which the Board are taking into account in connection with this matter; and it concludes with the remark that as "before long the jurisdiction which the Board of Trade now exercise in regard to electric lighting matters in the Metropolis may be transferred to the County Council," the Department is "most unwilling to take any action which might hamper that body in dealing with the question in the future." This is a most significant declaration, as indicating that the Board of Trade are already contemplating the commencement of that process of devolution of powers which was so much discussed during the progress of the Local Government Bill last session. The local inquiry under the Electric Lighting Acts, upon the Metropolitan applications for Provisional Orders, commences to-day before Major Marindin, R.E.; and the report of the inquiry is to be forwarded to the County Council for their information. Their observations are invited before the Department take action upon the report. All this is very reasonable; but it does not make the way of the electrical speculators easier before them.

What American gas engineers and electricians are likely to esteem a rather important letter has been written to a member of the Ohio Legislature by General Hickenlooper, the well-known President of the Cincinnati Gas Company—favouring, under certain circumstances and conditions, the supply of electric lighting by gas companies. It appears that the letter has been educed by the fact of a Bill for enabling gas companies to provide electric lighting being before the State Legislature. Many Ohio gas engineers think electric lighting might be a profitable branch of their business; and this Bill is for the purpose of enabling them to make the new departure openly, instead of indirectly as at present. On the other hand, the unlicensed establishment of speculative electric lighting plants, running untrustworthy wires in all directions over a city, in defiance of feeble municipal protests, is described by General Hickenlooper as a source of danger to the public, while the speculators seldom or never do any real good for themselves. In view of these facts, General Hickenlooper thinks that if electric lighting were taken up as a branch of a respectable, prosperous gas company's undertaking, the work would be better and more cheaply done, the consumers would be better satisfied, and the city authorities would have a responsible party to call to account in the matter of wiring, if necessary. General Hickenlooper regards electric lighting as a small thing in comparison with gas supply. He does not think it can ever become a serious competitor with gas, but admits that it has some special uses and advantages which warrant a few people in patronising it. "My idea is," he says, "that if the citizens of our city, for any reason, even an imaginary one, desire this character of light, it is but just to them that we should supply it in the best possible shape and at the lowest possible rates." He goes on to say that the Cincinnati Gas Company have every year to dispose somehow of thousands of bushels of breeze, which is good steam fuel, on the spot, but is not worth removal. There is a lot of heat wasted from the retort-benches, moreover, which might be used to generate steam. Office and establishment expenses, rent, &c., would also be reduced to the minimum; and as the net result of all these considerations General Hickenlooper believes that the Cincinnati Gas Company could work an electric light station "at an expense 33 per cent. less than an independent organization. While they are doing but little, if any, better than paying running expenses, we can supply this character of light to the public at lower rates than they are now paying, and make 10 per cent. manufacturing profit." It must be conceded that General Hickenlooper puts his view very fairly; but when we remember how he has been fighting the electric light in Cincinnati for years, it looks a little queer to hear him admit that electric lighting may be good for something—if only he has the supplying of it in his own hands.

There has been a nice little bit of by-play at Chelmsford, where the firm of Messrs. R. E. Crompton and Co. have just succeeded in getting a contract with the Corporation for the lighting of the streets, to the temporary discomfiture of the Gas Company. The factory of Messrs. Crompton and Co. is situated in Chelmsford; and it has been a sore point with the firm that the town has continued to be lighted by gas, while they have gone afield for business. The concern has lately blossomed out into a joint-stock Company; and whether it is that the change has made the managers of the business more reckless, or they are more sensitive to the reproaches of visitors who have had to make their way to the electric light factory through gas-lit streets, they have as a matter of fact made a desperate bid for the street lighting contract, and have secured it. They have undertaken to light about 1½ miles of the main streets with 20 arc lamps, and to maintain 110 incandescent lamps of 32-candle power in about 9 miles of other thoroughfares, for £700 a year. We do not hesitate to state that it cannot be done for the money. The arc lamps are worth at least £22 10s. a year each, as the Lighting Committee fully understand; and this leaves £2 5s. 6d. each for the incandescent lamps. The thing speaks for itself. Messrs. Crompton and Co. want the advertisement; and they are prepared to give the Chelmsford people the equivalent of at least £400 a year for it. As the current will be supplied from their own works, their commercial reputation will be at stake on their doing better than Messrs. Chamberlain and Hookham at Leamington or Mr. Joel at Barnet. We must be quite prepared to have the lighting of Chelmsford thrown in our face as an example of the success and cheapness of electricity as applied to the lighting of streets; but it is useless to argue a question of advertisement. It is certain, however, that what Messrs. Crompton are willing, for their own purposes, to do for Chelmsford, they will not do for the City of London, the electric lighting of which is going begging, and might be had by the firm to-morrow, even at a considerable advance upon their home rates.

Water Supply in Victoria.—Tenders have been received by the Victorian Water Supply Department for the construction of a weir across the Goulburn in the neighbourhood of Laanecoorie. The weir will consist of a masonry dam 320 feet in length, of a maximum height of 52 feet; and of an earthen dam 700 feet in length. The storeage capacity of the dam when completed will be 600 million cubic feet. A contract for the work was let recently to Mr. A. O'Keefe for £57,321; but, owing to a sudden and unexpected increase in the value of cement of 6s. 6d. per barrel, Mr. O'Keefe intimated to the Department that he could not carry out his engagement upon the terms originally agreed upon by him. The officers of the Department considered that it was not desirable, under the circumstances, to hold him to his agreement; and the work was re-advertised. Mr. O'Keefe was again lowest, for £63,541; and his tender has been provisionally accepted.

Development of Coal in Canada.—It is well known to geologists that in many parts of Western Canada there are extensive coal deposits, the successful working of which must be of great importance in the development of the Imperial traffic through the Dominion and on the Pacific. A large block of land, in which are thick and extensive seams of anthracite coal, has lately been worked by a Canadian Company in the cascade district of the Bow River Pass, and, as reported, with excellent results. This land covers the croppings of the veins, which dip from 32° to 60° in the side of the mountains, which rise from 500 or 600 feet to 2000 feet above the croppings. A tunnel 209 feet long has now been driven; and this is 45 feet above the water-level, and cuts through 22 seams of coal. Three of these seams are being worked. The overlying seam measures about 9 feet, of which 7 feet are coal; the middle seam has from 3 feet to 3 ft. 6 in. of clean hard coal; and the underlying seam is about 5 ft. 8 in., with 10 inches of slate near the centre of the seam. These are the only seams as yet practically tested; but from them about 15,000 tons of coal have been removed and shipped to the Pacific coast.

The Consumption of Gas at Grantham.—The statement made by Mr. W. Barratt, in his presidential address at the recent meeting of the Eastern Counties Gas Managers' Association, that it is "poverty" that stands in the way of increased consumption of gas at Grantham, is disputed by a correspondent, signing himself "One of Them," in last Tuesday's issue of the *Nottingham Express*. He says: "He [Mr. Barratt] appears to think that it is chiefly poverty that stands in the way of increased consumption; but I think it is the extortionate demand of the Company in requiring £1 deposit for a private house before they will put the gas on. It is not everybody that can afford to place a sovereign in the pockets of the Gas Company, especially when in large towns like Manchester, where the population is 50 per cent. more migratory, the deposit required is only 5s. In no working man's house, I should think, is more, or as much as a sovereign's worth of gas used in six months; and why the Company should require such a deposit is hard to understand, unless it is that they want to be too secure against risks, and consequently hurt themselves. The inhabitants of Grantham are not migratory, by any means—certainly not sufficiently so to warrant such a heavy deposit. I think, if the Gas Company would take this into consideration, they would find the true cause of what they complain of. I hope they will not flaunt that great point they are so proud of doing, that the depositor gets 5 per cent. for his money, because you can get 5 per cent. in any town; but they may depend that there are plenty of people in Grantham willing to have gas and pay for it, but object on principle to place their sovereigns in the Company's hands."

THE SUBSTITUTE FOR PHOTOMETRY.

Is photometry as applied to gas a discredited practice? The question is suggested by the reported refusal of the Board of Trade to assist in preparing the way for the deposition of the Parliamentary Standard Candle from its present place in the law of gas lighting. If, after all that has been done to establish photometry on a proper footing, we are to hold that, for want of anything better, the candle must continue to be used as the standard and unit of light, it follows that photometry is discredited, for its indications must always participate in the vagueness and general unreliability of their basis, the candle. Photometrical determinations will never be anything else than approximate, so long as the candle is employed in the process; and there is no prospect of escape from this detrimental connection. Vernon Harcourt, Dibdin, Methven, Sugg, and other would-be reformers have worked in vain, or nearly so, if the candle is to be indefinitely retained as the legal standard of light *faute de mieux*. With all our improved methods of investigation and observation, our wisdom has not improved upon the wisdom of our ancestors, who took the next thing to their hand for a standard of light, just as their forefathers went to work in the most obvious way to settle the unit of length. "Stop sixteen men coming out of church," says an old geometer, "without selecting them; and let them stand one behind another in a line, the toes and heels of their right feet touching. Then the distance from the toe of the first to the heel of the last is a perch, and one-sixteenth of it is a lawful foot." Nothing "scientific" about this standard of length; but it has measured more than any other, and holds its own against innovation. Must we conclude similarly that the standard candle is the best that could be imagined? Not so; only that it is nearly as good as any other standard that has yet been devised. Whether the candle is too good to be thrown aside, or the possible substitutes too indifferent to be chosen in its place, the result is the same, and the fact remains that the Board of Trade cannot see the way clear to even a permissive alteration of the law of gas testing.

In view of this barren result of the labours of reformers in photometry for the last twenty years, one can well imagine the most enthusiastic photometrists experiencing a sudden conviction of failure, followed by a not easily lifted weight of despair. Is all photometry a delusion, and is approximation to the desired result all that can be looked for by this means? If so, let us rest content with the approximations that may be most readily attained, and not trouble ourselves further. Philosophical instrument makers may, for the good of their trade, refine upon light measuring apparatus and its appendages; but wise gas-makers will cease to trouble themselves over the problematical half-candles of testing. It may be imagined that the person who will be as cheered as regular photometrists will be disheartened by the present aspect of affairs, is Mr. Frederich Lux, whose ingenious gas-balance indicates the one way out of the difficulty that has been found feasible. The more photometry is discredited for gas testing, the brighter the prospect of supplanting it by some other process; and few other systems besides that of which Mr. Lux's balance is at present the most convenient example, appear to be available for this purpose.

There is a good deal to be said in favour of testing the commercial value of gas by some other method than that of photometry. It is not as if the commodity was imponderable, like electricity, or as if its luminous value depended upon any particular construction or disposition of the burner. Indeed, this is one of the awkward conditions of the photometrical test. The necessity for settling upon the standard burner to be used in testing has exposed gas manufacturers to a great deal of unmerited obloquy. They have been accused of circumventing the intentions of the legislature by procuring the adoption of a description of test burner which yields better results than others in vogue at the time of the drafting of the law on the subject, and thereby representing their gas as better than it really is. It has been stated that merely by virtue of their sharp practice in this regard, the common coal gas which a generation since was valued at 13-candle power is now sold by the London Companies as 16-candle gas. Consumers' burners are now as superior to the test burner, however, as they were once inferior to it. Particularly since the introduction of the modern regenerative burners, the valuation of gas as of 14, 15, 16 candle power, and so on, has become a conventionality. Photometrists might reasonably be asked why this conventionality should be perpetuated by the revision of photometry with regard only to the standard of light and not to the gas-burner. Why should not the latter part of the instrument be subject to alteration, so as to keep pace with progress in the utilization of the intrinsic illuminating value of the gas?

The jet photometer and the illuminating-power meter are both applications of the principle that the specific gravity of a sample of coal gas, which determines its durability and rate of flow through an opening, affords an indication of its illuminating value. The method of weighing it is another application of the same principle; and it is open to be argued that the principle is as good as that of direct comparison of the luminosity of a flame with a standard. It is certain that the preference given by the law to the latter principle has tended to obscure and depreciate the former; but now perhaps the discomfiture of photometry may operate to direct attention to what is in one sense the fairer principle. To illustrate what we mean by this last expression, we may revert to the remarks about the sharp practice of gas companies in making the same gas pass for 16 as for 13 candles by improving the burner. There is no doubt the gas is really the same, and that luminosity is to a great extent a function of the burner, as well as of the gas; or the common classification of burners, as good or bad would be meaningless. When we know that the same gas which burnt by means of an iron batwing will only give a duty of 2 candles to the cubic foot, may be made at the same rate of combustion to yield 8 and 9 candles per cubic foot in a recuperative lamp, the argument for taking the composition of the gas itself as a guide to its value receives an accession of strength. If a troublesome and costly analysis of the gas were required in order to obtain this information, there would be an immediate objection to such an inquiry; but seeing the facility that is offered to investigation for this purpose by the fact that, apart from impurities, the heavier a coal gas is, the richer it is in light-giving constituents, the objection does not apply. Exhaustive analysis is not required, and the determination of specific gravity in the case of coal gas is the easiest of operations of the laboratory, thanks to the ingenious student of this subject. Taking the gas supplied to London as an example, the composition of the products has altered very little if at all during the period for which records of analyses exist. The ultimate composition of common coal gas sold in London in 1851, upon the authority of Mr. John Leigh, of Manchester, cited in last week's JOURNAL (page 529), was, approximately, as follows:—Illuminants, nearly 4 per cent.; light carburetted hydrogen, nearly 38 per cent.; hydrogen, nearly 53 per cent.; carbonic oxide, 3·64 per cent.; oxygen, nitrogen, carbonic acid, water—together little over 2 per cent. Twenty-five years later Mr. Humpidge found in London gas illuminants averaging 4 per cent.; light carburetted hydrogen 35 per cent.; hydrogen rather over 50 per cent.; carbonic oxide average nearly 5 per cent.; nitrogen risen to 4 per cent. This last component and the rise in carbonic acid probably show the effect of the exhauster. The last analysis, made in 1887, for the Society of Arts, by Mr. C. J. Wilson, shows no important change. Olefines still average 4 per cent.; and the figures referring to the other principal components scarcely differ from Mr. Humpidge's, beyond the margin allowable for testing. If, as Mr. Lux maintains, it is possible with his gas-balance to read with accuracy the specific gravity of gas within the usual limits of 0·4 and 0·5 to 0·002, and to eliminate the disturbing influences of carbonic acid and moisture, it would appear that here is a method of determining the light-giving capacity of coal gas without the photometer and its unreliable but inevitable candle.

To sum up, the object of this brief discussion of the subject is to raise the question whether the photometer cannot be dispensed with, not merely on account of the unreliability of the candle, but also taking into consideration the fact that the rating of the value of a sample of coal gas by its performance with a conventional standard burner is imperfect and misleading. We do not pin our faith to the Lux balance or to any other single application of the principle that the value of coal gas is obtainable from observation of its specific gravity or composition. The idea is to draw attention to a neglected field for research, which may come more into notice in the future than in the past. All is said in regard to photometry. No more important researches and tests are to be expected in this direction until a fresh standard of light is suggested by some authority entitled to respect; and meanwhile, it is at least possible that more good may result from a study of the other principles upon which the illuminating value of gas may be determined.

THE NEW SCHEME OF WATER SUPPLY FOR VIENNA.—Referring to the new scheme of water supply for Vienna, which, as stated in the JOURNAL last week, has been engaging the attention of Mr. John Aird, M.P., *The Times* correspondent in that city states that it is proposed to bring the water from the gravel deposits in the hills near Wiener Neustadt to Vienna. A number of Austrian financiers have obtained a 99 years' concession for the purpose; and the caution-money is to be deposited in June. The work will have to be completed within two years of that date. The same authority says: "Mr. Aird's object in visiting Vienna has been to ascertain whether the scheme could be taken in hand by himself, assisted to some extent by English capital. I am informed that his report on both these points will be favourable; and that Vienna, like Berlin and Amsterdam, will eventually be indebted for its water supply to British enterprise. The cost of the proposed works in Vienna will amount to about £2,000,000."

PROJECTED ELECTRIC LIGHTING SCHEME FOR BRUSSELS.—At their meeting on the 25th ult., the Municipality of Brussels decided on inviting tenders from electric lighting contractors for carrying out a scheme of electric lighting in that city. This step is one which may be attended by very important consequences for the citizens; seeing that the gas supply, with which the new system will compete, is in the hands of the Municipality, who manage it with the strictest regard to the general good. Already, the Gas Committee have had to stand against the competition of oil; and they have done so very successfully. Whether or not they will be equally fortunate with the new rival they are about to introduce will remain to be seen. The supply of 10,000 lamps of 16-candle power in a specified area is the extent of the project; but, of course, it will not necessarily be confined to this number. The requirements of private and public lighting are to be provided for; and the price of the current per 100 watt-hours is to be stated in the tender. The concession will be for eighteen years at most; and the Municipality will reserve to themselves the right to take over the works and plant at the expiration of three, six, or nine years or at the end of the term.

Notes.

Analyses of Common Coal Gas.

For the purpose of the trial of motors for electric lighting recently conducted by the Society of Arts, analyses of the coal gas consumed by the different gas-engines were, as already mentioned, made by Mr. Charles J. Wilson, of University College. The gas used was the common coal 16-candle gas supplied to South Kensington by The Gaslight and Coke Company, and all the experiments were made in the month of September, 1888. In each case three samples were taken, at the beginning, middle, and end of the trial, and these samples were mixed together for the purpose of analysis. The result was as follows:—

	Volumes of Dry Gas.		
	Crossley Engine Trial, Sept. 19, 1888.	Atkinson Engine Trial, Sept. 21, 1888.	Griffin Engine Trial, Sept. 27, 1888.
Oxygen . . . . . } Carbonic acid . . . }	0·51	0·52	0·36
Carbonic oxide . .	3·96	4·19	4·58
Olefines	3·77	4·07	4·04
Marsh gas	37·34	37·73	36·14
Hydrogen	50·44	48·56	50·94
Nitrogen	3·98	4·93	3·94
	100·00	100·00	100·00

Average composition of olefines: 1 vol. = 1·81 vols. C_2H_4.

The apparatus employed by Mr. Wilson is illustrated and described in the *Journal* of the Society.

Sulphate of Ammonia for Manuring Grass Lands.

Some very important experiments on manuring grass lands have been made by Mr. Martin J. Sutton in pastures contiguous to his private residence at Dysen's Wood, about five miles from Reading. Mr. Sutton has just issued his report of three years' experiments on six different varieties of pastures by 18 different methods of treatment. The tables accompanying the report are very comprehensive; and the following selections from them will be interesting to gas engineers, as showing the value of sulphate of ammonia. In the spring of 1886, six plots were enclosed on each of six fields—the first being an old pasture, designated A; the second a five-year old pasture, described as B; and C, D, E and F being under other conditions. The treatment of the six plots was in the several instances precisely alike—No. 1 receiving no manure; No. 2, 1 cwt. of sulphate of ammonia, costing 14s., in 1886 and again in 1888; No. 3, 1½ cwt. of nitrate of soda, costing 16s. 3d., in each of the two years; No. 4, 3 cwt. of superphosphate and 2 cwt. of kainit, costing 15s. 9d., in the same two years; No. 5, 1 cwt. of sulphate of ammonia and 2 cwt. of kainet, costing £1, likewise in 1886 and 1888; and No. 6, 3 cwt. of superphosphate, 2 cwt. of kainet, and 1 cwt. of nitrate of soda, costing £1 8s. 9d., also in 1886 and 1888. It will be seen that no manure whatever was placed upon any of the plots in 1887. We can only give below the net gain or loss on the manurings afforded by the produce of last summer for the fields A and B, stating likewise the several quantities of grass yielded:—

Plots.	Produce. Tons. Cwt. Qrs.	Gain. s. d.	Loss. s. d.
2 A.	8 7 1½	36 3	—
2 B.	5 14 3½	5 9	—
3 B.	5 16 3½	7 9	—
3 A.	5 13 3½	—	20 9
4 A.	6 11 1	—	12 0
4 B.	5 2 0	—	6 0
5 A.	6 18 0½	—	2 9
5 B.	6 2 1½	4 0	—
6 A.	6 8 2½	—	29 6
6 B.	5 11 1½	—	7 3
1 A.	6 16 1½		
1 B.	5 3 1½		

The Rate of Combustion of Explosive Gaseous Mixtures.

At the meeting of the Berlin Physical Society on the 8th ult., Dr. Michelson delivered an address on the normal rate of combustion of explosive mixtures of gases. Having described the methods adopted by M.M. Mallard and Le Chatelier and by Bunsen for determining the rate at which combustion is propagated, he pointed out that an objection which may be urged against the method of the first-named investigators is that the velocity with which the flame is propagated increased very rapidly the further it travels, so that it is uniform only at the beginning of the explosion. The objection to the second method is that the flame is continually wavering in and out of the edge of the burner. Dr. Michelson made use, in his experiments, of the dark cone in the centre of the flame, in which the gases are still unburnt, and of which the luminous envelope forms the limit of the commencing combustion. When the rate of supply of the combustible gases is uniform, this cone is very steady, and the rate at which the gases stream out from its surface is exactly equal to the rate of combustion of these gases. The volumes of the gases consumed were measured in accurate meters, and the size of the luminous envelope to the centre cone of the flame was determined from photographs of the flame. The mixtures examined were those of coal gas and air, hydrogen and air, carbonic oxide and oxygen, hydrogen and oxygen, carbonic oxide and air, and of methane and air. With coal gas and air the rate of combustion increased as the mixture contained more of the coal gas, reaching a maximum with 18 per cent. of this gas, and then gradually became less; the maximum rate of propagation of the combustion was 70 centimetres per second. With hydrogen and air, the maximum rate was observed with 40 per cent. of hydrogen in the mixture, being then 270 centimetres per second, and then becoming less. The curve representing the rate of combustion of carbonic oxide and oxygen presented a very different appearance. The maximum rate was only obtained with 75 per cent. of the carbonic oxide, and was about equal to the maximum for coal gas. For the other three mixtures, no curves could be drawn. With a mixture of hydrogen and oxygen, Dr. Michelson estimated the maximum rate of combustion as being about 10 metres per second, but no actual measurement was possible, since the mixture could not be expelled at this rate from the burner, which consisted of a glass tube 1 metre long.

Communicated Articles.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XIII.

Some of the earliest investigations into the nature of the illuminants contained in coal gas are those made by Dr. Andrew Fyfe, who used chlorine as an absorbent. In the first few volumes of the Journal of Gas Lighting, the results of a number of experiments on gas from different kinds of coal, carried out by this gentleman, will be found. Though very useful at the time, when they probably represented the only information on the subject available to many, they are now interesting in an historical sense only, on account of the advancement in our modes of distillation and condensation. Dr. Fyfe was disposed to place great value upon his chlorine process, coupled with his well-known durability test, as a means of indicating the quality or value of any particular sample of gas. Indeed, he was inclined to rank these as equal, if not superior, to photometrical methods. Mr. Alexander Wright did not agree with his conclusions; and the subject was discussed by these gentlemen at considerable length. The chlorine process was analogous to the use of bromine, sulphuric acid, or other absorbent, and has now been entirely displaced in favour of these more conveniently applied reagents; and throughout the discussion there was no question raised as to the accuracy of the process, but merely whether the percentage by volume of the illuminants really constituted reliable information as to the value of the gas. Mr. Wright contended that the matters absorbable by chlorine (*i.e.*, those generally spoken of as the illuminants or the hydrocarbons) did not represent the whole illuminating constituents of the gas—a contention which subsequent experience has shown to be correct, as has just been noticed.

The following table represents some of the results recorded by Dr. Fyfe in the course of his numerous experiments upon different kinds of coal. As he resided in Scotland, his attention was chiefly confined to Scotch and North of England coals:—

—	Make per Ton.	Specific Gravity.	Condensation by Chlorine. Per Cent.
Coal—			
Newcastle (average) . .	—	·414 to ·512	3·5 to 5·5
Do.—South Pelton . . .	9,746 c. ft.	·555	6·5
Cannel—			
Wigan	10,500 "	—	7·6
Ramsey	9,750 "	—	12·5
Midlothian	10,100 "	—	13·0
Leamahago	10,176 "	—	17·5
"	11,020 "	—	17·1
Wemyss	10,000 "	—	19·5
Kirkness	9,620 "	—	20·7
Boghead	14,800 "	—	27·0
Yorkshire	11,500 "	—	7·66

An objection to the use of chlorine for the absorption of the illuminants in coal gas is the fact that it combines very energetically with hydrogen and also with marsh gas, when exposed to sunlight, or even to ordinary daylight. In the first place, hydrochloric acid is formed; in the second, an oily liquid containing chloroform and tetrachloride of carbon. So that, in order to get satisfactory results, it would be necessary to conduct the experiment in artificial light. If water is present with a mixture of chlorine and marsh gas, decomposition of a portion ensues; the hydrogen combining with the chlorine, and the oxygen with the carbon, according to the following reaction:—

$$CH_4 + 2\,H_2O + Cl_8 = CO_2 + 8\,HCl.$$

It is worthy of notice that chlorine is capable of absorbing the whole of the hydrocarbons, and also the free hydrogen in coal gas. Unfortunately, its reactions with hydrogen and marsh gas are very energetic and violent in character. This, combined with its poisonous nature, renders it advisable that experiments with it should not be undertaken except by those who are fairly well skilled in chemical manipulation. Possibly this is the reason why it has dropped out of use. Although Dr. Fyfe employed it for many years, subsequent experimenters appear to have discarded it entirely in favour of bromine and other absorbents.

The general idea appears to have been that the absorbable hydrocarbons consist to a great extent of ethylene; and they were generally spoken of as a single substance. It is natural, therefore, that they should have been regarded as in some sense a direct measure of the quality of the gas. In those days, the number of different kinds of coal that had been brought into use for

the manufacture of gas was extremely limited; and the operation was confined to a narrow range of temperature by the general use of cast-iron retorts. So it is possible that, in this comparatively narrow circle, the illuminants produced from different kinds of coal possessed a much stronger family likeness than is observable at the present time, when many varieties and mixtures of coal are used for gas-making, and they are subject to all sorts of conditions in respect to size of retort, temperature of distillation, weight and duration of the charge, with or without dip, condensing arrangements, &c. The results of a large number of experiments led Mr. Lewis Thompson to lay down the following as a practical rule:—Percentage absorption by bromine × 5 = photometrical power in standard candles. So that a gas which yielded an absorption of 3·3 per cent. on treatment with bromine, would possess an illuminating value of 3·3 × 5 = 16½ standard candles. A rule of this sort assumes that the illuminants are, to all intents and purposes, constant in character and composition. After the introduction of the exhauster and of clay retorts, the fact soon became evident that the composition of coal gas was liable to variation from so many causes that it did not admit of being gathered into the compass of any rule having reference to specific gravity or illuminating power.

It should be remarked that many of the opinions and conclusions of these earlier writers have been handed down and reproduced in so-called modern books of chemistry. For example, in an important work on chemistry published a very few years ago, may be found the following statement:—Coal gas consists essentially of hydrogen, marsh gas, and olefiant gas. Such opinions and conclusions were fairly warrantable, and indeed creditable to their originators, looking at the extent to which investigation on these matters had then been carried; although the subsequent extension of operations has shown them to be incorrect.

An important series of articles under the title of "Investigations upon Coal Gas—Influence of Marsh Gas, Ethylene, and Tetrylene (Butylene) upon the Illuminating Power of Coal Gas," was contributed to the JOURNAL OF GAS LIGHTING about 25 years ago by Professor A. G. Anderson.* To several of the results included in these articles, some allusion will be made under the head of the different substances concerned. Amongst other things, Professor Anderson directed attention to the subject of the relation between condensation by bromine and illuminating power. He tried some experiments upon Staveley coal with the following results:†—

Kind of Coal.	Condensation by Bromine. Per Cent.	Illuminating Power. Candles.
Staveley	3·8	11·1
"	3·8	11·3
"	3·9	11·5
"	3·8	10·9
"	3·5	10·6
"	3·4	10·3
"	4·2	13·2
"	4·1	13·2
"	4·1	12·9
"	4·6	13·9
Staffordshire	4·9	14·8
"	3·2	9·2
South Wales	2·4	7·1

He remarks that the effect of each unit percentage of illuminant appears to be the addition of about 3 candles illuminating value to the gas. A gas of 12½ to 13 candle power very uniformly contains about 4¼ per cent. of illuminants absorbable by bromine. In support of this opinion, he quotes the results of some experiments made by Mr. F. J. Evans, which are as follows:—

Condensation by Bromine. Per Cent.	Illuminating Power. Candles.
3·75	11·50
4·00	12·00
4·00	12·50
4·20	12·50
4·30	12·50
4·50	12·75
4·50	14·00

He does not overlook the kernel of the matter in experiments of this nature. In explaining some of the discrepancies, the importance of giving full particulars of the burner used is insisted upon. And this is the real difficulty. We perhaps decide that, in order to secure uniformity, the whole of a series of experiments should be conducted with one particular burner. If there is a wide variation in the qualities of the gases to be operated on, it is certain that no one single burner is capable of doing justice to the whole. Indeed, some of the samples may not be consumable at the standard rate, to any satisfaction. If any one quality of gas is to be consumed to the best advantage, we must have a burner of special dimensions, &c., to suit it. If in the endeavour to escape this dilemma, it is decided that each sample of gas shall be consumed to the best advantage, then a burner perfect in regard to each kind must be at hand; for any subsequent improvements in respect to burners will upset the whole calculation. Professor Anderson gives full particulars of the dimensions, &c., of the burner employed in his experiments; and the results of his researches should be considered as applying to that kind of burner only.

An important paper was contributed to the West of Scotland Association of Gas Managers in 1874, by Mr. W. Young, on "The Absorption of the Illuminating Constituents in Coal Gas by the Heavy Hydrocarbon Oils," in which attention was directed to a notable property of these illuminants from a gas-making point of view. It was founded upon a number of experiments carried out by Mr. Cusiter, of Dalkeith (then recently deceased), whose attention was first directed to the subject by experiments on the use of glycerine as a substitute for water in wet meters. Finding that, although this substance was satisfactory both in respect to non-evaporation and low freezing point, it injured the quality of the gas, he tried other fluids. A mineral oil, sp. gr. 0·840, was applied; and he was surprised to find that it reduced the quality of the gas from 28 to 14 candles, and the percentage absorbable by bromine from 11·1 to 5. A 35-candle gas was passed through the meter; and its quality was reduced to 16·1, and the bromine percentage from 17·4 to 6·2. Paraffin spirit of sp. gr. 0·768, the distillate of crude paraffin oil, sp. gr. 0·810, ordinary burning oil of ·820, refined mineral oil of ·840 and ·860, and blue oil of ·895 were respectively tried; the gas being passed through the fluids at a temperature of 50° to 55° Fahr. In every case the action was appreciable—though greater with the denser oils. The lightest of the fluids—which was paraffin oil of ·768—only reduced the illuminating power; to the extent of 5 per cent.; when the temperature was increased to 60° it had no effect; and at 70° there was a gain of 7 per cent. By passing through the heavy oils, the gas was depreciated to the extent of 65 per cent.; and when the gas and the heavy oil were agitated together, the illuminants were almost entirely removed.

Some experiments were made with a view of arriving at the quantity of illuminants that these fluids were capable of retaining. They were accordingly treated with the gas till saturated, with the following results:—

Name of Oil.	Sp. Gr.	Increase in Bulk. Per Cent.
Once-run oil	·810	12·5
Burning oil	·820	13·5
Heavy oil	·840	15·0
Lubricating oil	·860	17·5
Blue oil	·895	19·0
Olive oil	·914	19·0

In order to separate the absorbed light-giving constituents from the heavy oils, the mixtures were placed in a still and very gradually heated, so as to cause the absorbed volatile matter to pass over to the condenser. The nature of the distillate was found to vary very much, being dependent upon the nature of the gases operated on, and more especially the temperature at which they had been distilled from the coal. It all cases it consisted of condensible hydrocarbons and of permanent gas. Gas obtained at a low temperature—similar to that applied for the production of paraffin oil—gave a distillate of 34 per cent. permanent gas and 66 per cent. liquid hydrocarbons similar in composition to light paraffin or petroleum spirit, as shown by the following tables:—

Distillate Coal Gas (*Sp. Gr. at* 60°, ·706).

Distils	10 per cent.	at 128°
"	50½ "	" 176°
"	82 "	" 212°
"	94 "	" 248°
"	100 "	" 300°

Petroleum Spirit (*Sp. Gr. at* 60°, ·703).

Distils	6 per cent.	at 138°
"	50 "	" 176°
"	84 "	" 212°
"	93 "	" 248°
"	100 "	" 280°

But gas made from the same coal at a higher temperature gave a distillate consisting of 36 per cent. permanent gas and 64 per cent. liquid hydrocarbons having a sp. gr. of ·852, and very much resembling the most volatile portions of the distillate of coal tar. It consisted principally of benzole combined with a number of other volatile hydrocarbons.

GAS-ENGINES IN BERLIN.—At the close of last year there were in use in Berlin 644 gas-engines, representing a total of 3423-horse power. Of these, by far the largest number (132, representing 474-horse power) were employed by printers and lithographers; the remainder being engaged in the following kinds of work:—Electric lighting, 93; coffee grinding, chaff cutting, &c., 66; lifting and pumping, 60; lathe driving and engineering, 51; metal working, 49; textile industries, 47; wood working, 45; ventilating, 25; paper industries, 14; miscellaneous, 66. At the close of the previous year, the number of engines in use was 555, representing 2080-horse power; being an increase of 89 engines and 1343-horse power in the year ending December last.

DURHAM ENGINEERING STUDENTS' CLUB.—At the meeting of this club, held at the Durham College of Science, on the 25th ult., a paper was read on the "Gas-Engine," by Mr. C. J. Gawthropp. He commenced by giving a brief historical review of the subject, in which he mentioned the early engines of Brown, Barnett, and others. He then passed on to the later engines of Lenoir, Hugon, Bisschop, Simon, and Otto and Langen; describing shortly their general characteristics. The lecturer next proceeded to discuss the gas-engines of the present day; discussing their respective working cycles and mechanical details. The Clerk, Griffin, Stockport, and Atkinson's differential and cycle engines were described—the latter three by the aid of models. Extracts taken from reports of various experiments with these engines, showing their mechanical and indicated efficiencies and rates of gas consumption, were given. In conclusion, the two great sources of loss of heat—viz., to the water-jacket and through the exhaust—were pointed out, and the means of overcoming them suggested. A discussion of some interest was commenced, but for want of time was adjourned.

* See JOURNAL, Vol. XIII., p. 344, *et seq.*

[† See JOURNAL, Vol. XIII., p. 775.

WATER BY MEASURE.

By Positive.

In a paper read before the American Society of Civil Engineers, in September, 1888, entitled "Some Facts in Relation to Friction, Waste, and Loss of Water in Mains," by Mr. C. B. Brush, there are several statements which will be of great interest to the readers of the Journal.

The population of Hoboken (U.S.A.) was about 33,000, and they consumed 4 million gallons of water per day; it being discovered that the waste from the mains and the waste of consumers was about equal. At another water-works mentioned the consumption reached its maximum amount of 128 to 130 gallons per head per day. These are the usual statements made by those who require a new method of rating, and are desirous of resorting to a supply by meter, or automatic meters, for the prevention of waste. It is surprising that managers of water companies should allow such statements to be made in order to uphold or propagate a new system, because it is the easiest process imaginable to detect whether three-fourths of the total supply is wasted by defects in the mains. In such a small town, by the use of the stethoscope and disciplined night inspection, ten to fourteen days would suffice to determine if there was the slightest leakage, and also give ample time to repair all defects.

The meter system is certainly a most expensive method of discovering waste. Mr. Brush does not give the cost of these machines, nor the expense of maintenance; but as we know that both of these items would entail a most serious expenditure for the water authority, it only seems fair that the consumer should pay a rent for his meter, and this may be so, but nothing is said about it in the paper. Mr. Brush states that "twice each year house-to-house inspections were made, as well as night inspections of the mains and service pipes." The night inspection is quite right and necessary for the detection of waste; but the half-yearly house-to-house inspection is not. There can be no excuse for it, when, as is well known, by night inspection the house where the leakage is taking place can be detected. It then becomes necessary only to visit the houses where the defect occurs, and each supply can be visited fortnightly in such a small town as that mentioned.

Where stop-cocks are fixed outside the houses, as is the case now in all well organized water-works, or a metallic sounding rod fixed on the pipe and brought up through the pavement, there can be no excuse for permitting waste, or the introduction of automatic devices, or a supply by measure as here introduced. The ordinary pressure-gauge, or the many recording gauges now in use fixed in the office, shows the pressure in the mains every hour of the day; and the night inspectors record the leakages every morning, so that by keeping the inspection and repairs constantly under hand, the pressure is maintained throughout the whole year with the utmost precision.

In adopting a supply by meter it was found necessary and desirable for sanitary reasons to charge a minimum rate to every house; but in the case under discussion this rate was but *slightly under the usual ordinary rate*, and not such a drastic measure as that propounded by the late attempt at Legislation to rob the London Water Companies, which Bill—"Water by Measure 'Metropolis Water,' Session 1884"—requested that: "When the quantity of water supplied in any quarter does not exceed 6000 gallons, 3s. per quarter, and when the quantity of water supplied in any quarter exceeds 6000 gallons, for each 1000 gallons or any fraction thereof 6d. should be charged." The only comment necessary on this measure is to state that section 22 provides for the Mayor, Commonalty, and Citizens of the City of London to pay all expenses of obtaining and passing the Act!

Mr. Brush states that, "in order to ascertain the effect of the meter system in a new district, 191 average dwellings were selected, which contained eight occupants to a house. These houses were metered. If house rates in each case had been charged, the daily draft per head would have been about 75 gallons, and the following result would have been obtained:—191 houses= about £530, daily draft 115,000 gallons. At house rates each house would have averaged about £2 15s. 6d. per annum; at meter rates the actual return was about £1 18s. 6d. per annum." If a parallel case is to be found in England, how it is to benefit the struggling water authority is not made clear. In the first place, there can be no well organized water company in existence supplying 75 gallons per head per day. This can easily and readily be reduced to 20 gallons without employing meters of any kind. Then it is stated that the meter system reduced this extraordinary unnecessary waste to 13 gallons per head per day, and also reduced the actual return 16s. per house per annum, and producing no beneficial result but that of ascertaining that in a *metered* district the draft of water is less in winter than in summer, and in unmetered districts the reverse is the case; though "during the extremes of cold and hot weather the draft per head is about the same in both districts, but after the extreme weather is passed, the waste in the metered district immediately ceases while in the unmetered district the waste continues for some time." This is contrary to my experience, for while there is no *waste* in the extreme hot weather (there is a greater quantity *used*), the waste by leaving taps running in frosty weather is very soon detected by the night inspector, and the remedy quickly applied. This is no argument for a supply by meter in England as the frost is of short duration, and waste from this source is not worth calculating. Few towns have had occasion to use stand-pipes for the last two years.

A table representing the high-service district is given, which states that 356 consumers out of a total of 775 used less than 16s. worth of water per annum (a fair average of two years work). The author states that, "in order to check this extreme economical tendency of some of our consumers in a new district, the company was obliged during the year 1886 to establish a low minimum rate depending upon the size of the meter attached to the consumer's service-pipe."

In the former case a minimum rate *slightly under the usual house rate* was charged—a rate probably sufficient to save the Company from bankruptcy; but, in the above instance, surely there cannot be any means known of pumping water to a high-service district, half of the houses paying but 16s. per annum, and the other half still more economical. What advantage is there here to induce water companies to discard the present method of supply and resort to a supply by meter? These statements fully bear out the objection that has always been urged in this country—viz., that the sanitary state of a town would suffer very materially if the water supply was stinted in any way; in other words if the consumer had to pay for each bucket of water used.

We are not told what the death-rate of Hoboken is, or what it costs to pump this high-service supply, sold out at 16s. per house per annum; or what is meant by high service. But as it was found to be non-paying, it may be supposed that the low minimum charge will scarcely recoup the undertakers. The further restriction of a "minimum charge" according to the size of the consumer's meter would, however, cause endless litigation in England; the consumers could not be educated up to it. A must pay the same as B, if he lives in the same class of house, and has the same appliances as B. Mr. Brush states that there are no restrictions as to quantity used or the time of use, &c., &c. Under the present system of rating there are no restrictions as to time of use, or quantity used; and the consumer *uses* the water without let or hindrance, having no fear of being over-charged by the eccentricities of clockwork mechanism. He has no anxiety as to cost; and the extra cleansing and sweetening of his premises is done with a will, and the health statistics of the town are kept up to a high standard.

Again, it is stated that "no inquisitorial examination of premises, so unpleasant to consumers, is required." Neither is such examination made under the present system, only when a leak or waste is *known* to exist; and after a long experience, I find both the owner and tenant are grateful for having the defects pointed out, and usually set about the repairs promptly, that the owner may not suffer injury to his property, nor the tenant be annoyed, by damp, or defective apparatus. This would not be the case if the tenant were supplied by meter. He naturally is desirous of paying, as per gas-meter (which he disputes regularly), about the same sum every quarter; but perhaps there has been a very minute leak underground and his bill amounts to six times his usual charge—for a hole in a pipe 0·060 inch, under a pressure of 50 lbs. per square inch, will run the consumer into an extra charge for 18,000 gallons per quarter. Water at present is supplied for trade purposes by meter; and those who have the inspection and care of meters know too well that the consumer will not consent to pay his bill if it is a little over the usual amount. The Company have to bear all expenses and losses, or be always in Court; and the readers of the Journal are kept well-informed of the treatment doled out to water companies by the ruling magnates.

Mr. Brush states that the majority of the consumers "pay less by meter than by house rates. This is quite clear from what has been previously stated; and is here again advanced as a recommendation for water companies to adopt supply by meter, also to furnish the meters and keep them in repair free of expense to the consumer except in the case of misuse or freezing! "The meters are then entirely under the control of the Company, who will naturally see that repairs are promptly made. *The consumer's interest is rather to see that such repairs are delayed.*" At what rate per 1000 gallons the supply is to be vended, or the rent of the meter to the consumer, is not stated. The Bill already referred to, which was attempted to be foisted on the greatest city in the world, allowed 6d. per 1000 gallons as a fair recompense to the much enduring London Water Companies; and also allowed the consumer to purchase his own meter. Alas for the repairs that meter would ever get without application to the Law Courts!

A number of tables are also added showing the results obtained before and after the adoption of meters by the Hackensack Water Company; and also showing the actual frictional heads per 1000 feet at velocities ranging from 2 to 3 feet per second, as compared with the theoretical frictional heads given by formulæ of D'Arcy, Weisbach, Kirkwood, Fanning, and others.

The Weights and Measures Bill, which, as will be seen by our "Parliamentary Intelligence," was read a second time last Thursday, although, in its present form, dealing mainly with the sale of coal, may possibly have special interest for our readers before it has passed its next stage. It was quite expected that the measure would contain some provisions in reference to the stamping of meters at intervals of seven years—a matter which has already engaged the attention of the Board of Trade; but this has not yet been done. The necessity for some alteration of the Sale of Gas Act in this respect has, however, been recognized; and it is not improbable that the scope of the Bill will be so enlarged in Committee as to embrace this subject. The further progress of the measure will therefore be watched with interest by our readers.

Technical Record.

IMPORTANT ALTERATIONS IN THE INSTRUCTIONS OF THE METROPOLITAN GAS REFEREES.

The Summer Instructions of the Metropolitan Gas Referees, which were issued last Friday, are of more than usual importance, inasmuch as, beyond the customary notification that the quantity of sulphur allowable per 100 cubic feet of gas is now reduced from 20 to 17 grains, there are some important alterations in the times and mode of testing the gas for illuminating power. We therefore reproduce this portion of the document.

The testings for illuminating power shall be three in number daily, to be taken at intervals of not less than one hour; but if one of these testings assigns to the gas an illuminating power differing by more than one candle from the illuminating power assigned to the gas by another testing, or if the average of three testings of illuminating power fall below the prescribed illuminating power, a fourth testing shall be made after a further interval of one hour.

The photometers to be used in the testing-places shall be the improved forms of the Bunsen photometer, prescribed and certified by the Referees. The burner attached to each photometer shall be a standard burner corresponding to that which has been deposited with the Warden of the Standards in accordance with section 37 of The Gaslight and Coke Company's Act, 1876. A description of the standard burners to be used for testing common gas and cannel gas respectively is given in Appendix A.* The gas in the photometer is to be kept burning for at least 15 minutes before any testing is made. The disc used in the photometer shall be either the improved Leeson or the Bunsen disc. When a disc is not in use, it should be covered, to protect it from dust; and if a disc is in any way marked or soiled, a clean disc is to be substituted. A clean chimney is to be placed on the burner before each testing.

The candles shall be such as are described in section 25 of the Metropolis Gas Act of 1860—viz., sperm candles of six to the pound, each burning 120 grains an hour. Two of these candles shall be used together. The three testings made on one day shall be made with three different pairs of candles. Each testing shall consist of ten observations of the photometer, made at intervals of one minute. When five observations have been made, the disc and mirrors are to be reversed by being turned round through half a circle. The average of each set of ten observations is to be taken as representing the illuminating power for that testing.

The rate of burning of the gas in each burner shall be 5 cubic feet per hour—a rate of consumption which is shown by the long hand of the meter making exactly one revolution per minute for several minutes consecutively.

The candles are to be lighted at least ten minutes before the beginning of each testing, so as to have attained their normal rate of burning. The Gas Examiner may ascertain whether the candles are burning at nearly the normal rate by placing a 4-grain weight in the candle-pan when the balance turns, and observing whether the balance turns again in one minute. Before each testing, the two candles are to be so placed that the plane of the curvature of one wick shall be perpendicular to the plane of the curvature of the other wick.

Before and after making each testing, the Gas Examiner shall counterpoise the candles; and if the rate of consumption per candle shall not have exceeded 126 grains per hour, or fallen short of 114 grains per hour, he shall make, and record in a book to be kept for the purpose, the calculations requisite to neutralize the effects of this difference. If the rate of consumption shall have varied from the prescribed rate beyond the above-named limits, or if the Gas Examiner should observe, during the testing, that the candles are burning irregularly, or that their flames are not exactly between the two plumb-lines which mark their true position, the testing is to be rejected, and a fresh testing made. Instead of weighing the candles, the Gas Examiner may observe the time in which 40 grains are burnt. This must not exceed 10·5, or fall short of 9·5 minutes. The Gas Examiner shall, at least once a week, compare the meter-clock with the standard clock in each testing-place.

At the time of each testing, the Gas Examiner shall observe and record the temperature of the gas, as shown by the thermometer attached to the meter, and also the height of the barometer. The volumes of the gas operated upon during the testings may be corrected from these data (the standard of comparison being for the barometer 30 inches, and for the thermometer 60°) by means of the table given in Appendix C. Suppose, for example, the thermometer stands at 54°, and the barometer at 30·3 inches, multiply the quantity of gas consumed by the corresponding tabular number, the product will be the corrected volume of the gas—*i.e.*, the volume the gas would have occupied when measured over water at the standard temperature and pressure. Thus:

Volume of gas consumed	5 cubic feet.
Tabular number for barometer and thermometer .	1·025

Then 1·025 × 5 = 5·125, the corrected volume.

Instead of thus correcting the volume of gas consumed, the same object may be attained by dividing the observed illuminating power by the tabular number, or in the manner described on page 8.

The Gas Examiner shall enter in his book the particulars of every testing of illuminating power made by him at the testing-places, immediately after such testing; and in the case of any testing which he rejects, he shall also state the cause of rejection. A form in which to record his observations and calculations is given in Appendix D. No testing is to be rejected on the ground that the result seems improbable.

[In addition to the alterations here indicated, some changes have been made in the directions for verifying the accuracy of the meters connected with the photometer and with the sulphur and ammonia tests.]

* This and the other appendices referred to are those with which our readers are familiar, having been given in the JOURNAL, King's "Treatise," and Newbigging's "Handbook."—ED. J. G. L.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

In the JOURNAL last week, we published the first part of our report of the proceedings at the half-yearly meeting of this Association at Bridgwater, on the 12th ult.—including the President's (Mr. J. H. Cornish's) Inaugural Address and a paper by Mr. J. J. Jervis on sectional hydraulic mains—and we now give the final portion.

Mr. HENRY SAINSBURY (Trowbridge) read the following paper, entitled

NOTES ON SCURFING RETORTS.

It was suggested at our last autumn meeting that, failing any promise of papers for to-day, the Committee should indicate a few subjects for discussion; and some three or four were named in the printed record of the proceedings at the Weston-super-Mare meeting of last year as being suitable for our consideration. With the understanding that I was only to give a few "Notes" of my experience on the above subject, and not a finished and exhaustive paper, I have consented to introduce it to you to-day.

There are, no doubt, various means adopted for the prevention and removal of the troublesome deposit on retorts. I do not profess acquaintance with them all, and will only speak of those in use at my own works; trusting it may be the means of bringing out from the members present a greater variety of plans, and more effective in their results.

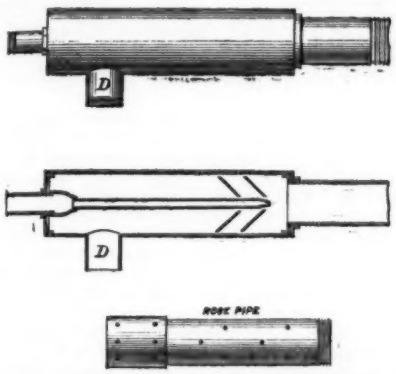
A word as to "prevention." Some managers, by the use of the anti-dip in its many forms, claim to dispense with scurfing altogether; but having never ventured on these—to my mind—dangerous experiments, carbon still is found on our retorts. We have lately, by the means of divided hydraulic mains in short sections, with separate tar-valves to each section (whereby the dip in each can be kept to the lowest possible seal), found the deposit very greatly reduced, and the make of gas increased per ton of coals carbonized.

Retort-scurfing, in my experience, divides itself into the orthodox first, second, and third. First, the old-fashioned method of 30 years ago, when the retorts were left to burn off the carbon by keeping the lid slack, and, when a little loose, prising it from the sides with a long chisel bar, or punching it off the back with the same instrument. The time of full moon, when the lamps were not lighted, or when a fresh bed of retorts was charged, were occasions eagerly taken advantage of for this purpose; and many a time a man would work away for a day or two at one retort, endangering the sides in prising off the carbon, or shaking the wall in punching the back ends. As soon as the stock of gas began to run down, some of the retorts would be charged again with perhaps 5 or 6 inches of carbon at the back; the sides having been hurriedly cleaned. I really believe there were some retorts never thoroughly cleaned from the first deposit till they were taken out for removal and renewal. Occasionally, a piece of old 1½ or 2 inch wrought-iron pipe was roughly built into the mouthpiece of the retort, the pipe reaching nearly to the back end, and the top cap of the ascension-pipe taken off to act as a chimney. The air drawn in through the pipe would, after a time, burn out a hole in the scurfing of the back, and enable it to be cleaned. This, however, was a work of time.

These were my early experiences of retort scurfing; but better plans were being adopted, especially by those who could get easy access to the back of the benches. When visiting the Frome Gas-Works, I noticed how they cleaned their retorts, and more particularly as to the backs. A hole about 5 or 6 inches in diameter was made in the back stopper, and a pipe carried from it through the back wall to the outside, ending with a screw, clip, and cover. I need scarcely describe the method of scurfing by this arrangement, as it is well known to most of you; and I suppose universally practised where it is possible. When a retort requires scurfing, the back cap is taken off, and a hole knocked through the carbon for the admission of air. A luted lid is placed over the mouthpiece, and the top cap removed from the ascension-pipe. Care must be taken to see it is not choked, as it forms a chimney, and draws the air through the retort, burning off the carbon, or so loosening it, that it readily gives way to a gentle pressure from the iron bar. A cast-iron air-spreader is pushed into the end of the pipe from the retort, which prevents the air from drawing directly through the retort to the ascension-pipe, and causes the air to pass over the back, and so burn the carbon off the most difficult part to be cleaned. I have found in practice that these spreaders quickly burn away; so I have had recourse to a piece of old retort, or fire-tile, which, being placed in front of the air-pipe, accomplished the same purpose. When neither of these was available, I have found three or four square bricks put one on the other answer in the

same way. This plan is simple and effectual; and we shall always use it when it can possibly be done. I have found that the direction in which the wind is blowing will hinder, or otherwise facilitate, the work. I usually find that a retort not very badly scurfed can be cleaned in twelve hours with a judicious use of the bar.

About three years ago, I had occasion to re-arrange some of our benches, and place them back to back; so that seven beds out of our thirteen cannot be cleaned by the method just described. What must be done? The retorts would scurf; and if no better plan was found, we must go back to the inefficient system of our early experience. On thinking the matter over, I remembered reading a paper by Mr. S. Rutter, of the Uxbridge Gas-Works, in the Appendix to the Transactions of The Gas Institute for 1882, on "The Deposit of Carbon on Retorts, and its Removal." I carefully read this paper again; and as the plan proposed was simple and inexpensive, I determined to give it a trial. In connection



with his paper, he gives a drawing of the apparatus employed, a copy of which is now before you. The following is Mr. Rutter's description of his method:—

"I do not claim quite a new idea in my mode; but at the same time I do not think any one else has ever tried the same kind of apparatus. It consists of a cylinder 3 inches in diameter and 12 inches long, having at one end a piece of ¾-inch tubing for a steam-inlet, which is continued by a ¼-inch brass tube (diminished at the end to $\frac{1}{16}$ inch jet) through to within an inch of the other end of the cylinder, where the outlet should not be less than 2 inches. Beneath the cylinder, within about 1¼ inches from the end admitting steam, is a 1¼-inch air-inlet, marked D on the drawing. The steam rushes out of the nose piece, draws in air at the aperture D, and drives it along the pipe to the end of the retort, and the mixture is distributed by means of a rose-pipe over the carbon, which it breaks up without injuring the retorts. It is on the same principle as the first steam-jet exhauster, and is, with regard to its construction, a large Bunsen burner; which can be seen by a glance at the drawing. The holes in the rose-pipe, which extends to the end of the retort, are ¼ inch, spaced 3 inches apart in three rows, one on the top and one on each side, excepting about 18 inches from the connected end, and at the other there is a cap with three or four holes in it also. The blower is so simple that it can be made by any blacksmith or tinsmith for a few shillings. Of course, in retort-houses of great length, several blowers could be used at the same time."

Mr. Rutter's experience of the use of this apparatus you can read for yourselves in the Transactions of the Institute. I will now give you mine. I had the blower and pipe made in every way as described above, but found it necessary, after a little experience, to make a slight alteration in the rose-pipe. I found, while the rose-pipe helped the cleaning of the sides of the retorts excellently, the cleaning of the back ends was a slow process. The back of the retorts was our principal difficulty, as the sides would soon go when the back was cleaned. I therefore substituted a pipe without holes instead of the rose-pipe, and left the end full open instead of the cap with holes. I find this soon burns a hole in the carbon wherever it is placed. If the retort is large, we move it from the centre to the sides, and so get the back quite clean. When this is done, what little remains on the sides is quickly removed by the bar. With the aid of this blower and pipe, we clean a retort after a month's work in six hours—that is, only losing one charge. The retort is not injured by constant punching; and a man will not be more than two hours attending to it altogether. Having a fair amount of boiler power, we find no difficulty in keeping two blowers at work, without interfering with the speed of the engine and exhauster. We bring our steam to the front of the retorts in a different manner to that described by Mr. Rutter in his paper; but every manager will arrange that as it may best suit his own works. In our case a ¾-inch steam-pipe is brought from the boiler, and runs along and rests upon the principals of the roof just over the front of the retort-beds. We find that one pipe will work for three beds. A steam swivel joint is inserted in the pipe at the centre of three beds, which allows a ¾-inch pipe to be pushed up into the roof or brought down to the retorts. Another swivel is attached to the end of this pipe, which allows the second pipe (the one connected to the blower) to move the distance between the farthest retorts on either side of the centre. By this means, you can with one pipe clean the top or bottom retorts in either of the three beds; the width embraced being about 20 feet. I find the 2-inch pipe used for the air-pipe to the back will usually clean some four or five retorts before it is entirely destroyed. I do not use new pipes; but old ones we may have in stock, or that I may be able to purchase at old-iron price.

Discussion.

Mr. W. Davis (Poole) did not think he could add much to what had been said in the paper; but he considered that the apparatus described, and the manner of working, was a great improvement on the method hitherto in general use. For some considerable time, it had been his practice to clean the retorts by means of a piece of old 3-inch or 4-inch pipe, introduced through a hole in the lid, and extending nearly to the back; the cap being removed from the top of the ascension-pipe in order to create a draught. The air passed in through the pipe to the back of the retort, and travelled forward to the front, burning off the carbon. A little sight-hole, closed by a plug or hinged cover, was made in the lid, to admit of seeing how the cleaning was progressing from time to time. Unfortunately, the piece of pipe would only last out one retort before melting. Some years ago, when he used lime for purification, he had made it a practice to fill the retort with limestone, so as to prepare some lime while it was standing off for cleaning; and he believed this plan facilitated the removal of the carbon. No doubt in large works, where through retorts were in use, these appliances were not found to be necessary, as a current of air through the retort was readily secured by leaving the lid loose at one end, and taking the cap off the ascension-pipe at the other.

Mr. T. W. R. White (Sherborne) thought it would have been well if the discussion on the two papers they had heard had been taken together, as the subject of carbon in the retorts was closely allied to that of the hydraulic arrangements. It was all very well to discuss plans for the removal of carbon, but he believed that "prevention was better than cure;" and the thing to be considered was how to reduce the formation as much as possible. This was one advantage that followed from the use of the separate sections of hydraulic, which admitted of the seal being reduced. Engineers of gas-works should take care to get retorts that were as impervious as possible. The deposit formed quicker on rough surfaces than on smooth ones; and more than that, it adhered more tenaciously to the former than to the latter. He applied a coat of liquid cement to the inside of his retorts, with a view of rendering the surface smooth and less porous, before using them. No doubt Mr. Sainsbury had introduced a useful apparatus; but with separate hydraulics to each bed, and the other precaution he had named, the formation of carbon was very slow, and easily disposed of.

Mr. E. C. Riley (Swindon) said he had lately given considerable attention to the formation and removal of carbon in retorts. He found that at small works where there was no exhauster, the accumulation of carbon was very rapid, especially at the back ends; and, of course, at works where there was an exhauster, they were not free from it. In a very small works he knew of, a bed of twos had been destroyed in six months entirely by the use of the scurfing-bar. Referring to "King's Treatise" for information on the subject, he found that the use of high-pressure steam was recommended; and he accordingly made an apparatus very similar to that described by Mr. Sainsbury. Having fixed the injector in a retort, so that the end of the pipe came within a foot of the back end, he added a screen or baffle of brick to direct the current against the sides and back of the retort, and to disperse the steam. The steam-nozzle was about ¼ inch in diameter; and he allowed a current of steam, varying from 90 to 135 lbs. per square inch pressure, to act for about two hours. At the end of that time, scarcely any effect was perceptible; and the steam pressure was increased to 140 lbs. He then tried the old plan of placing the lid a little slack, and taking the cap off the top of the ascension-pipe; and the difference between the efficiency of the old plan and that of the new was barely distinguishable. He was greatly taken with the idea of having the air-pipe at the back of the retort; but, unfortunately, it happened that at many of the works under his care, it was absolutely impossible to get at the back ends. The retorts were set close back against walls on rising ground.

Mr. J. J. Jervis (New Swindon) remarked that he understood the air, and not the steam, was the active agent in removing the carbon; and he would be glad to hear Mr. Humphry's opinion on that point.

Mr. N. H. Humphrys (Salisbury) said that the steam could only act as an agent for increasing the draught of air which was necessary to combustion. The carbon in the retort was burnt up in just the same manner as carbonaceous fuel was burnt in a grate. The use of any considerable quantity of steam must result in loss of heat, since the specific heat of steam was very high. Perhaps Mr Riley used such an excess of steam—for a large quantity of steam would rush out under the pressure named—that the temperature in the retort was reduced below that at which combustion would obtain. Carbon in retorts might be compared to anthracite coal, which was a dense form of fuel, and required a high heat and good draught for its combustion.

Mr. H. F. Vincent (Frome) considered that the steam was a hindrance and deterioration to the air rather than otherwise. He used the plan mentioned in the paper, of having an air-pipe at the back of each retort, and could clean the dirtiest retort in 12 to 18 hours without steam.

Mr. T. Hardick (Salisbury) said that at Salisbury they used the same plan, and successfully to his belief, though he now left all these details to Mr. Humphrys. No question ever arose as to difficulty in cleaning the retorts.

Mr. Sainsbury, in reply, said he had tried the plan of burning lime in the retorts, referred to by Mr. Davis. He did not quite follow the point raised by Mr. White. They all found that the

retorts got dirty, whether slow or fast; and therefore it could not but be advantageous to talk over the best way of taking off the carbon. He did not use any baffle, but allowed the steam to play straight at the back of the retort. Possibly the high pressure of steam used by Mr. Riley caused the retort to be filled principally with steam, so that but little air could get in.

The PRESIDENT observed that he had listened to the discussion with pleasure, but must admit that he preferred the old plan, and used the scurfing-bars, although he had known retorts to be broken. He considered the burning process a very slow one indeed.

It was agreed that the following paper by Mr. J. THOMAS (Bodmin), owing to the absence of the author, should be taken as read, and the discussion postponed to the next meeting:—

TAR FIRING.

The question of firing retort-benches with tar instead of coke has engaged the attention of gas managers for many years; and various modes have been adopted for its management. The chief difficulty, to begin with, was in getting a constant flow of tar into the furnace uninterrupted by stoppages, which were caused by the regulating-cock, or other appliance, not answering its purpose, and by the carbonizing of the tar in the delivery-pipe; thereby choking it up and rendering it uncertain in action. To obviate these difficulties, various plans have been resorted to; but the best means used by the writer for overcoming them are as follows:—First, to fix the tar-supply tank as near to the furnace to be supplied as convenient, and just a foot higher than the tar-injector inlet. A cock is screwed into the side of the tank, to which is attached a piece of compo. pipe ⅜ inch diameter and 10 inches long. To this a ½-inch iron service-pipe is connected, the other end of which is joined to the injector. By these means, it is found that, at the ordinary temperature of the tar-well (cold weather excepted), 4 gallons of tar per hour are delivered in a constant stream into the furnace. If more tar is required, the piece of ⅜-inch tube must be shortened, or a larger tube substituted; and if less tar is required, it must be lengthened. The risk of stoppage in the nozzle of the injector is overcome by the steam-jet, which scatters the tar into spray, and thus keeps everything clear.

By the use of the foregoing, it was found that the retorts were much too hot; and believing a less quantity of tar would do the work better, the flow of tar was stopped for an hour at a time. During this interval, the nozzle of the injector got red hot; and the small quantity of tar left in the pipe carbonized, causing a stoppage, which necessitated its being removed to be cleansed, and then refixed—an hour's work at least. To get over this difficulty, the writer invented the removeable plug injector. It is very simple, being fitted and ground in like the plug of a cock, having inlets on either side for tar and steam. This plug injector can be removed, the tar stopped in two seconds, and refixed in a similar time. The furnace door and frame adopted for use with this injector is illustrated by the photograph [exhibited]. The shell of the injector is firmly bolted to the top part of the door-frame. The door is swung horizontally, having a rack in the form of a quadrant, by which it is regulated to any required height, and to admit any quantity of air.

This apparatus has been in use at the Bodmin Gas-Works for three months this winter on a new bench of six retorts, 15 inches diameter, and 9 feet long. With these retorts 35,000 cubic feet of gas were made in 24 hours; and frequently 2½ cwt. of coal per retort has been worked off dead in four-and-a-half hours. About 80 gallons of tar per 24 hours were used on these occasions; but, to carry on the work in a regular way with six-hour charges, 60 or 70 gallons per 24 hours will keep the bench at a higher heat than by coke firing. The bench is charged three retorts at a time, with three hours between the charges. We use four gallons of tar per hour for two-thirds of the time; and the injector is taken out one hour before each charge, and replaced afterward. Sometimes it is kept out for one-and-a-half or two hours, depending on the quantity of gas required. If gas is plentiful, the tar may be stopped for five or six hours at a time; and when put to work again, the bench is as hot as ever in two hours. Of course, when the tar is stopped, the furnace-door is closed, completely shutting out cold air.

With reference to injury to retorts by this mode of firing, the bench in question has just been let down; and the four lower retorts show no signs of any cutting away, or undue wear—not so much as coke firing is capable of doing; but the two top retorts have suffered about 3 feet from the back end, just where the greatest heat ascends. The furnace was specially designed for tar-burning. There is no ash-pit; this being paved over with bricks at the level of the fire-bars in the coke-furnaces. The retorts are supported by four piers, in addition to the front and back walls. These piers have openings 2 feet wide, and arched over 8½ feet high; giving plenty of room for the combustion of the tar. On examination of the piers and sides of the furnace, these parts are found as perfect as when they were built; not being cut away in the least, or apparently reduced in size; but the two back arches—especially the back one—are cut badly; this being the only part of the setting that has suffered. It will have to be protected by thicker brickwork and tiles before it is again brought into use.

Mr. Terdrey, of the Tavistock Gas-Works, has adopted this method of firing; and in the course of a letter from him, referring to the matter, he says: "I have made a 24-hour test; and with 73 gallons of tar, I have worked off 2 tons of coal in a setting of six retorts, maintaining a splendid heat. My mode of working is as follows:—Starting with the six retorts charged—10 cwt. to the charge, and four charges to the 24 hours—after the charge is run in, I find three-and-a-half hours tar burning is ample, after which time the injector is taken out, and the door shut, until we again, 'strike covers,' when the injector is again put in action. The combustion is simply perfect—no smoke, no trouble, splendid heats, and less labour—and as for wear on the setting and furnace, it is not as much as with ordinary coke firing. You may fairly cry 'Eureka,' and style your method the '*Par Excellence*' tar-injector." In a postcript to the letter Mr. Terdrey remarks: "Please remember that 2 tons is not the maximum I could work off with the same amount of tar. The bench could easily do another 10 cwt."

GAS LIGHTING AT OPORTO.—The contract for the gas supply of Oporto, which was given to the Compagnie Général d'Eclairage et du Centre, will be contested by the Société d'Eclairage du Bassin de Mons, on account of a clause having been introduced by the former Company which was not referred to in the original specification.

THE "LUCIENT" REGENERATIVE GAS-LAMPS.—In the JOURNAL for Feb. 19 last (p. 345), we gave an abstract of the specification taken out by Mr. A. O. Brown for a new type of high-power regenerative gas-lamp, which is now being manufactured by Messrs. Alexander Brown and Co., of Glasgow. The special advantages claimed for this appliance are that it does not smoke, that it is not so liable to derangement as are other similar lamps, and that by its use great economy of gas, with high illuminating power, is ensured. The lamp has lately been tested, with reference to the last-named claim, by Mr. Robert R. Tatlock, F.R.S.E., &c., the Gas Examiner for Glasgow, according to whose report it has been fully sustained, although the trials were made under certain disadvantages; the photometer and testing-house being inadequate for the determination of the capacity of the lamp. Although the illuminating power was increased from 4·50 to 17·88 candles per cubic foot of gas burnt, it was believed that this was not the highest possible yield, as, in order to make a test, the consumption had to be reduced to far below the proper working capacity of the lamp. In London, however, Mr. C. Heisch, F.I.C., F.C.S., the Gas Examiner for the Corporation, has been able, with the apparatus at his command, to ascertain the actual capabilities of the lamp as a lighting appliance; and he has found that, with a consumption of 13·4 cubic feet of gas per hour, it has an illuminating power of 288·912 candles, or 21·485 candles per foot. This is certainly a very high duty; and if it can only be sustained, or even nearly approached, in every-day work, it should ensure for the appliance a front place in the ranks of regenerative high-power gas-lamps.

ELECTRIC LIGHTING AT THE PARIS EXHIBITION.—Our readers have already been informed of the important part the electric light will play in the illumination of the building and grounds of the Universal Exhibition, which will open in Paris on the 6th prox. All the arrangements are being carried out on a most extensive scale; and additional interest attaches to the installation from the fact that this will be the first great exhibition in the French capital at which the services of the electric light will be brought into use, inasmuch as it took no part in the display of 1878, on which occasion the galleries had to be closed at night. The building to which the public will soon be admitted will, however, be as attractive by night as by day. In the course of an article in *La Nation* for the 20th ult., the writer gave particulars of the lighting which it may be interesting to reproduce. As already stated, the work is in the hands of a Syndicate, composed of the principal electric lighting companies in Paris. A very important field for the operations of these companies is the Machinery Section. This consists of a central hall, 383 metres long by 114 metres wide, and 45 metres high, containing a superficial area of about 49,000 square metres; an adjoining gallery, on the ground level, having an area of 16,675 square metres; and a gallery above this. The floor area of the Machinery Section totals up to 77,000 square metres, or nearly 20 acres. The lighting will be done by four groups of 12 naked arc lights, each of 60 ampéres, placed at a height of 40 metres. These will be furnished by the Gramme Company. Then there will be 86 enclosed lights, each of 25 ampéres, fixed some 15 metres lower than the others, in five parallel lines. These lamps will be furnished by various companies. The adjacent gallery and the one above it will be lighted by 276 arc lamps of 8 ampéres each, placed at a height of 5 metres. Arc lamps will also be employed for lighting the other galleries, as well as for the open spaces, yards, gardens, bridges, banks of the Seine, &c.; but for the vestibules and staircases, incandescent lamps will be used. The motive power required for the production of all this light will be supplied from six central stations, the largest of which (that of the Gramme Company) covers an area of 640 square metres, and comprises five engines and dynamos—three of 175, and two of 100 horse power. In addition to these central stations, which will represent a total of 3100-horse power, secondary stations will be located at various points in the Machinery Section. In connection with the outdoor lighting, there will be the apparatus required for the luminous fountains, which will be attractive features of the gardens, as they were at our own recent exhibitions at South Kensington. In this department of the lighting, 30 arc lamps of 40 ampéres are to be used.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

The Nineteenth Annual Meeting of this Association was held at Boston, Mass., on the 20th and 21st ult., under the presidency of the Hon. A. M. Norton. Brief allusion to the proceedings has already been made in our columns; and we are indebted for the following particulars to the Official Report, revised by the Secretary (Mr. Chas. H. Nettleton), and published in the *American Gaslight Journal*. The preliminary business having been disposed of,

The President delivered his Inaugural Address. He welcomed the members to the meeting, and congratulated them on the prosperity enjoyed by the Companies they represented; at the same time expressing the opinion that whether this prosperity increased or diminished in the future depended to a great extent upon themselves. Referring to the comparative merits of gas and electricity, he said that for some purposes—such as theatres, public buildings, squares, and streets—electricity was a better light than could be furnished by the gas of to-day; but in the essential elements of cheapness, reliability, and adaptation to general use, gas retained a decided superiority. Notwithstanding the number of electric light plants that had been put down, it would be difficult to point to a single city or town where the use of gas for lighting had not been steadily increasing year by year. Undoubtedly great improvements would yet be made in the development of both gas and electricity as illuminating agents; and the decisive victory for one or the other would probably be won upon the fields represented by inventions and improvements in burners and lamps. It was a noteworthy fact that, although the electric lamp of to-day was two or three times as efficient as that of 1878, the gas-burners in general use were very much the same as they were ten years ago. On the authority of the best scientists, it was said that in the ordinary gas-burner 200 units of available energy were consumed in order to obtain one unit of such energy in the form of light; and might it not be well, he asked, if gas companies were to offer some pecuniary inducement to inventors and scientific men to produce a burner that should utilize the immense force in gas which is to-day being used so extravagantly. The competition between gas and electricity should be manly and generous, for neither had anything to gain by deprecating or underrating the merits of its rival; and he knew of no good reason why a gas company should not furnish electric lights where they were needed. It was also important that every attention should be devoted to the extension of the utilization of gas for heating, cooking, and motive power; though apart from these it was probable that the employment of gas for lighting would continue to increase. Even if the competition of electricity should lessen the demand for gas as a lighting agent, the loss could be more than compensated by pressing the other uses of gas, and developing them with energy.

Mr. E. C. Jones (Boston) next read a paper on the "Elements of Gas Analysis." After referring to the labours of Bunsen and others, he said that a gas analysis apparatus was valuable, and if it combined simplicity, accuracy, and economy of time, it was indispensable in a gas-works. Not only was it useful for ascertaining the work done by any purifying agent or piece of apparatus, but in mixing coal and water gas, it was essential that frequent analyses should be made, as the relative quantities of carbonic oxide and illuminants would indicate the thoroughness of the mixing. He briefly glanced at the Cooper tube, and other appliances, including Orsat's arrangement; and he then went on to give full particulars of the construction and use of Hempel's apparatus, which, in his opinion, was well suited for gas engineers. It was important that the room and the whole of the apparatus should be at an even temperature during an analysis; and the hands should not be allowed to come in contact with the gas-containing vessels, which should be furnished with wooden stands or bases. The water used for filling the burettes should be prepared by placing it in a large wash-bottle, and allowing a stream of gas to blow through it for some minutes.

At the close of the paper, a few questions were asked by members interested in the process, and replied to by Mr. Jones. He said that when using the Hempel gas apparatus daily, the pipettes would need refilling about once a year; and he had experienced some trouble with the palladium test. He preferred palladium asbestos to black palladium; did not operate on more than 20 cubic centimetres of gas; and took care that the absorbable constituents were previously completely removed.

Mr. J. L. Hallett (Springfield) followed with a paper on "Lima Crude Oil *v.* Cannel Coal." He said the original cause of his trying the oil was having a large quantity left on hand as a residue from an unsuccessful experiment in applying it as fuel. It was received in tank cars, emptied into an underground store-tank, and raised as required into an overhead tank of 200 gallons capacity in the retort-house. From this it flowed by gravity through a 1¼-inch pipe to a special retort, and was injected by a jet of steam through a ¼-inch tube. At no point was it exposed to the air; and therefore no odour from it was perceptible about the works. The injector was connected to a 2-inch pipe, which extended 7 feet into the retort; and the oil gas passed off through an ordinary ascension-pipe to the hydraulic main, where it mixed with the coal gas. The quality of the gas could be adjusted as desired, by increasing or diminishing the supply of oil; and there were no naphthalene deposits since it had been in use, although formerly considerable trouble had been experienced from this cause. In previous years he used 93 per cent. of Youghiogheny, and 7 per cent. of cannel coal, and obtained an average yield of 11,290 cubic feet of 18-candle gas. Substituting for the cannel 5½ gallons of Lima oil per ton of Youghiogheny coal, he obtained nearly 12,000 cubic feet of 18½-candle gas. Each gallon of oil yielded 118 cubic feet of gas. It cost 1½d. per gallon, and effected an economy, as shown by a year's trial, of 2s. 3d. per ton of coal. There was no complaint from consumers about smoky gas. The oil gave to the gas a white colour (making it resemble water gas) which was not so diffusive as the rich orange colour of pure coal gas. The effect on the purifiers was not noticeable: and the 2-inch pipe in the retort lasted two or three weeks. He used the oil in one retort of an ordinary setting, and though at first troubled with lampblack, he did not have any now. He thought the use of steam prevented it. If too much oil or steam was used, the heat of the retort was lowered, and lampblack was produced. He was also, at the outset, troubled with liquid deposits in the syphon boxes near the works; but he had entirely obviated this.

In the discussion on the paper, Mr. Snow remarked that he had used Lima oil, but not with such good results as those mentioned by Mr. Hallett, though it had been fairly satisfactory. He, however, was obliged to use it in a different way, because he only had steam available during cold weather. He made a cartridge of a 4-feet length of 3-inch wrought-iron pipe plugged at one end. This was packed with small coke, and filled with oil a sufficient time before being used to enable the coke to absorb the oil. It was closed with a piece of coke, luted with clay; and after the retort was charged, it was thrown in on the top of the coal the last thing. During one period of six months, coal and 4½ per cent. of cannel were used, and the average yield per ton was 11,130 cubic feet of 18-candle gas. The cost of the material was 2s. 0½d. per 1000 cubic feet of gas made. During a second period of six months, no cannel was used, but 6·3 gallons of oil per ton of coal instead. The yield per ton was 11,822 cubic feet, including the gas from the oil; and the quality was nearly 19 candles. Allowing for the weight of the oil, the yield was still considerably more than that from the coal and cannel; and the cost of the material per 1000 cubic feet of gas made was just under 1s. 11d. Mr. Nettleton had visited the Springfield works; and the result of his inspection, together with the information just given, was an impression that the Lima crude oil was the cheapest enricher obtainable. The present cost, he was informed, was a little over 1d. per gallon; and they now learnt that about 5 gallons per ton would bring up the quality of gas from ordinary coking coal to 19 or 20 candles. The cost of the enriching material was therefore about 6d. per ton of coal, or much cheaper than cannel. He observed that Mr. Hallett claimed to have saved 2s. 3d. per ton of coal carbonized, which was a large economy effected with very little trouble. Mr. Coggshall said he had used the Lima oil with very similar results to those stated in the paper; but it caused great complaints of smoky ceilings, &c., amongst the consumers—probably due to getting the gas too rich. He had gone back to Breckenridge cannel, although he had a quantity of oil in stock. Mr. Pritchard had successfully used the Lima oil with results something like those given byMr. Hallett, and considered it preferable to naphtha, as being cheaper and more workable. Mr. Sherman had tried it, and found it cheaper than cannel, but had not used it long enough to say more. Mr. Allyn had employed the various products of petroleum as enrichers for eight or nine years. He tried the Lima oil, but did not succeed very well with it. The yield and quality of gas were not so good, and the odour of the oil was objectionable. Replying to a question, Mr. Hallett said he had about 1200 stoves in his district, and did not find, as one of the results of using Lima oil, any complaints that the gas created an unpleasant smell when burnt therein.

Mr. A. F. Cooper (Exeter) followed with a paper on "Incidents in the Life of a Superintendent of Small Works." He said he took charge of the works at Exeter in 1883, and the results of the first year's working were: Total output, 2,646,500 cubic feet of gas, of which 2,054,900 cubic feet were accounted for by meters, 211,800 cubic feet were consumed in the public lamps; 83,000 cubic feet were used on the works, and 297,800 cubic feet were unaccounted for. This had increased last year to: Total output, 4,797,100 cubic feet; consumed by meter, 3,841,900 cubic feet; consumed in the public lamps, 506,700 cubic feet; used on the works, 86,200 cubic feet; and unaccounted for, 363,300 cubic feet. The average make per ton was 10,400 cubic feet. The mains were divided into two sections, and fitted with leakage-testing arrangements; and whenever services were laid or repairs made, the soundness of the system was tested. This was also done every six months. The meters were carefully checked every month. He was always on the look-out, and solicited new business wherever there was any opening—always interviewing the owners or future occupiers of new buildings, and offering to put in pipes at cost price. In a similar manner he pushed the use of gas-stoves and street lamps. In conclusion, Mr. Cooper described a cheap and simple governor (consisting of an ordinary bell, guides, and disc valve) that he had made.

Those of our readers who are specially interested in the development of electric locomotion will shortly have an opportunity of engaging in an undertaking of this character with material ready prepared to their hands, as the whole of the plant of the Elieson Electric Company, Limited, in their works at Stratford, together with the Company's patents, is about to be sold by public auction. The insufficiency of the means at the disposal of the Company to extend the system so as to meet present requirements is the reason assigned for the disposal of the property.

Register of Patents.

SEPARATING SOLID AND LIQUID IMPURITIES FROM GASES.—Foulis, W., and Liversedge, A. J., of Glasgow. No. 4372; March 22, 1888. [8d.]

This invention—which has for its object to separate impurities mechanically suspended in coal and other gases, and also adapted for being used in other manufactures wherein liquid or solid substances have to be separated from gases or fumes—consists in imparting to the gas a rapid rotating motion by means of revolving blades or vanes enclosed in the outer collecting case. The centrifugal action thus set up causes the heavy impurities suspended in the gas to be thrown against the case, from which they trickle into a channel or other suitable receptacle forming part of or connected to the case, and removed therefrom by any suitable means.

Fig. 1.

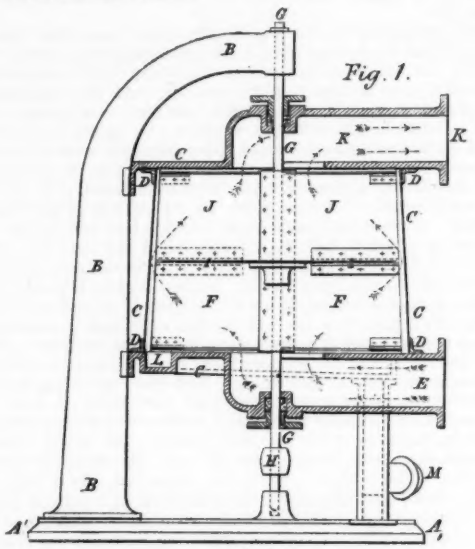


Fig. 2.

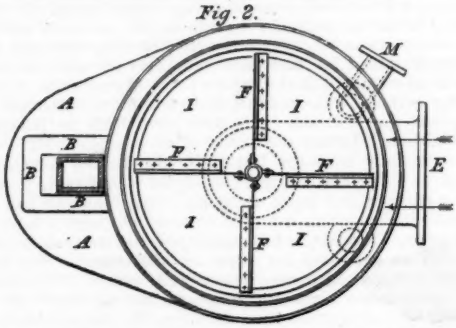


Fig. 1 is a vertical section (partly in elevation) of what the patentees believe to be the best form of apparatus wherewith to carry out their method of separating liquid or solid substances from gas or vapour; and fig. 2 is a horizontal section.

The mechanism is carried upon a base plate A, from which a pillar B rises. The upper and lower parts of the enclosing casing C are attached by brackets to the pillar by bolts or equivalent fastenings. The side of the casing is preferably composed of sheet iron or steel; and it is held by angle-irons D to the upper and lower parts of the casing. The lower part of the casing is formed with an inlet E. On the gas entering the apparatus, it is rapidly rotated by the lower blades or vanes F, attached to the central spindle G, which is provided at its lower part with the driving-belt pulley H. On the shaft there is carried the horizontal disc I, which forms a division between the lower set of blades or vanes F and the upper set of blades or vanes J. The result of this construction is that the gas passing through the apparatus cannot rise at once directly upwards to the top, but is compelled to pass wholly beneath the disc I, and around its periphery, as indicated by the arrows. On passing above this, the gas is submitted to further separating action by being driven round by the upper blades or vanes J. The gas, on rising above the vanes J, passes through the central opening in the upper part of the casing, and thence by the outlet duct K. The liquid and solid substances or impurities which have been separated from the gas by centrifugal action of the blades or vanes are projected against the inner inclined sides of the casing, down which they trickle into the annular receptacle L at the bottom of the casing. This receptacle inclines downwards towards its outlet; and the separated matter is collected at the discharge orifice M, or led therefrom to any suitable place of collection.

MANUFACTURE OF AMMONIA AND AMMONIA SALTS.—D'Andria, M. N., of Stetford. No. 5762; April 18, 1888. [6d.]

The patentee says that his improvements consists in boiling commercial sulphate of ammonia containing 24 per cent. of ammonia with magnesium oxide or hydrate. Free ammonia is given off, and magnesia is left in the still. Ground or precipitated carbonate of magnesia may also be employed in place of the magnesium oxide or hydrate. In this case, of course, sulphate of magnesia and carbonate of ammonia, or a mixture of carbonate of ammonia and ammonia, is obtained. The cost of a ton of ammonia is, says the patentee, by this method considerably reduced; and the wear and tear of plant is by no means so heavy as when lime is used. About 132 parts of ammonia sulphate requires for complete decomposition about 40 parts of magnesia, and produces about 246 parts of Epsom salts and 34 parts of ammonia.

GAS MOTORS.—Rowden, W. T., of Dumbarton. No. 5774; April 18, 1888. [8d.]

This invention has for its object, firstly, to obtain increased efficiency in motors which depend for their energy upon the heat due to the explosion of mixtures of combustible bodies and air in cylinders fitted with pistons, whether such bodies be supplied as gases or as liquids to be converted into vapours or spray in the motors themselves; and, secondly, to obtain a better distribution of the work, so as to lessen the jerking effect of the impulsive action of the explosion on the fly-wheel and machines driven by the motor.

The invention—which may be applied to any motor in which the impulses act in one direction in a cylinder on a piston connected with the main driving-shaft and fly-wheel of the motor by a connecting-rod and crank, or an equivalent disc and eccentric pin—comprises an improved combination of apparatus or mechanism for carrying the work of the expanding gases to the main or driving shaft of the motor. With a given number of revolutions per minute of this shaft, it is possible to decrease the time during which work is being done in the cylinder by the hot expanding gases; and thus to decrease the loss due to the heat passing into the sides of the comparatively cold cylinder, without materially altering the time allowed for the ignition of the combustible mixture at or near the commencement of the working out-stroke of the piston. It is also possible to intercept for a time any desired portion of the work done by the expanding gases at that part of the travel of the piston when most power is, in the usual arrangement, being communicated to the fly-wheel and machines driven by the motor, and to restore the work later in the cycle when less or no work is being done by the gases in the cylinder.

WASHERS AND SCRUBBERS FOR GAS.—Chandler, S., S., and J., of Kennington Oval, London. No. 7691; May 25, 1888. [8d.]

This invention of washing and scrubbing devices for gas is so arranged as to cause liquor from the last or foulest bay of a washer-scrubber to be carried back to a bay or bays through which the liquor has already passed, so as thoroughly to extract the ammonia from the gas, increase the strength of the ammoniacal liquor, and effectually purify the gas from other impurities.

Fig. 1.

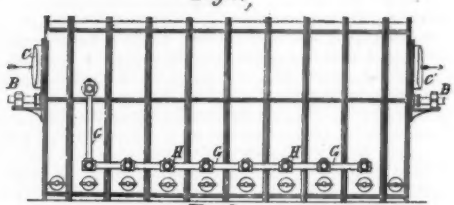


Fig 2.

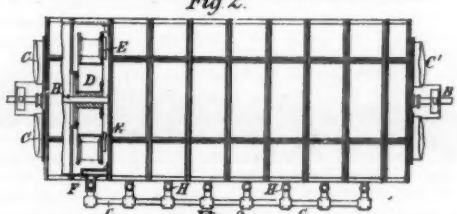


Fig. 3.

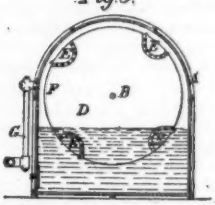


Fig. 1 is a side elevation of the washer-scrubber; fig. 2, a plan (partly in section) of the same; and fig. 3, a vertical section of fig. 1.

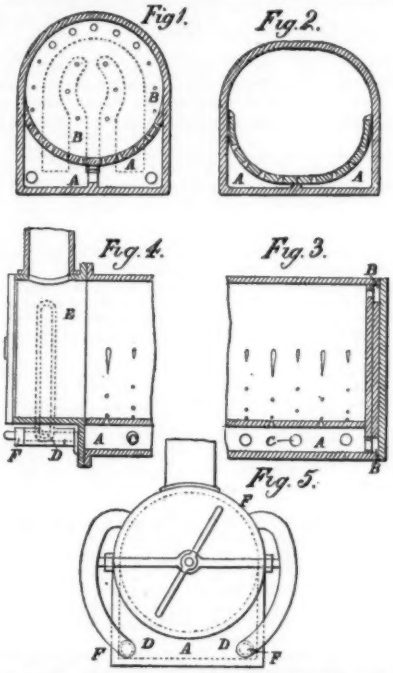
The body or casing of the apparatus is divided into bays or chambers containing water or other suitable liquid (the level of it being successively lower from one end to the other of the casing). B is a shaft carrying revolving scrubbing devices adapted to be maintained in a wet condition by passing through the liquid in the chambers, and C, C¹, are the gas inlets and outlets respectively. All these parts are substantially the same as described in patent No. 4928 of 1877. D is one of the now well-known scrubbing devices mounted on the shaft; and E are buckets secured to the side of the scrubbing device in the chamber containing the liquid at the lowest level. F is a trough upon the inner side of the casing adjacent to the buckets; and G is a pipe extending from the trough to all the other chambers, so that as the liquid is raised by the buckets and discharged into the trough, it will flow into the several chambers. H are cocks by means of which the liquid can be shut off from any chamber desired.

The surfaces of the scrubbing devices are advantageously composed of wood bars in the form of plasterers' laths; and they are carried between side plates (of preferably segmental shape) slotted to receive them. The slots are advantageously arranged so that the laths of one layer come opposite to the spaces between the laths of the next layer, and *vice versâ*.

The segmental sections thus formed are secured to a wheel between discs, so that they will rotate with the central shaft.

GAS RETORTS AND OVENS.—Green, L. H., of Dartford, Kent. No. 1508; Jan. 28, 1889. [8d.]

This invention has special reference to improvements applicable to gas retorts and ovens made of cast-iron, fire-clay, or other suitable substance, for carbonizing coal, In such retorts and ovens of the usual construction, says the patentee, the charge of coal, while within the retort and being distilled, is surrounded by the closed inner surface of the retort, excepting only the upper portion of the charge, from which alone the gas as it is evolved can freely escape. The gas evolved from the covered portion of the charge is imprisoned thereby, and has no free escape; consequently it hinders the evolution of further gas, and lengthens the process of manufacture, besides which such imprisoned gas is liable to become decomposed by being too long subjected to the heat. The especial object of this invention, therefore, is to remedy these defects, and to construct retorts and ovens in such a manner as that the gas evolved from the portions of the charge that are adjacent to the supporting surface of the retort can also freely escape, whereby a speedier treatment of the charge, a better quality of gas, and a more abundant yield are obtained.



Figs. 1 and 2 represent transverse sectional elevations of retorts constructed in accordance with this invention. Figs. 3 and 4 represent longitudinal sectional elevations of the back and front ends of the retort. Fig. 5 represents a front elevation of the front end of a retort.

The retort is constructed with one or more under and laterally extending gas-receiving chambers A, preferably extending up the sides of the retort as far as the usual depth of the charge. Such chambers may be formed in the construction of the retort by dividing it across as in fig. 1, or it may be subsequently formed by tiles secured in position as in fig. 2. Provision is made for the escape of the gas evolved from the under part and sides of the charge into such chambers by communicating openings or ducts of any suitable shape, size, and number. Provision is made for the escape of the gas evolved at and towards the back end of the retort (if not a through retort) by constructing or adapting the back with communicating ducts B of any suitable shape, size, and number, into which the gas is led from the retort by channels opening into the back end of the retort, and from which ducts the gas is led to the chambers A by other openings. The back of the retort is preferably left solid at parts, in order to withstand rough usage on the charge being inserted and drawn. Provision is made for the escape of the gas from the chambers (which, if there are more than one, communicate by openings or channels C by means of outlet-pipes D, adapted with branches leading into the mouthpiece E, whence it escapes together with the gas passing directly from the retort up the ascension-pipe. The outlet-pipes D may be further utilized as sight-holes for examining and cleaning the interior of the chambers, and as means permitting of the retorts being re-heated by the admission of air, should the retorts have been allowed to cool down prior to the charge being withdrawn. For such purpose, when required, air may be admitted by loosening the stoppers F.

APPLICATIONS FOR LETTERS PATENT.

4227.—DEMPSTER, R. and J., "Improvements in means for automatically governing and controlling the pressure of gas in service-pipes and mains." March 11.

4231.—SHEARD, J. T., and HARRISON, S., "Indicating the extent to which gasholders, tanks, wells, or other reservoirs are charged." March 11.

4423.—BATTY, T., "An improved method of constructing gas-stoves." March 14.

4453.—GALLI, J., "Improvements in gas-stoves for domestic purposes." March 14.

4573.—WALLWORK, R., and WELLS, A. C., "Improvements in self-generating gas or vapour burners." A communication from E. Grube. March 16.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

GASHOLDER CUPS.

SIR,—I must disown any connection whatever with the letter by "Engineer and Contractor" which appeared in the JOURNAL for the 19th ult., and which your correspondent "Designer," in last week's issue, evidently attributes to me. "Designer," in common with "Engineer and Contractor," makes the mistake of spoiling his case by overstating it. He begins by assuming the plates forming the sides of the channel-iron cups to be only $\frac{1}{4}$ or $\frac{5}{16}$ inch thick, where in the bent cup it would be $\frac{5}{16}$ or $\frac{3}{8}$ inch thick. He must know that this is understating the one (the Sydney cups are $\frac{3}{8}$ inch), and, if anything, overstating the other. The fact is, all well-designed modern channel-iron cups have the plates of sufficient thickness to allow for *corrosion*. The reason why the bent cup is somewhat thicker than the "square" cup is not for resisting corrosion, but because you cannot help making it so; it would not be strong enough or stiff enough without it. I think I proved fairly, in the articles on the Sydney gasholder, that the metal in the former case—viz., channel cups—was better disposed for strength and stiffness.

Next as regards the attachment of dip carriages. The flat base is certainly easier to make, fit, and fix than the curved one. As for strain, "Designer's" assertion that in the bent cup "the direction of the strain will always be normal to some point of contact between the carriage and the cup or dip," applies equally well to the channel cup; because, in resisting the "couple," the base is thrust hard down on the back edge, and tends to lift on the front. In the bent cup, however, the whole carriage tries to revolve on the rounded surface of the dip; thus diminishing the tensile, but increasing the sideway or shearing strain on the bolts. In the channel cup there is more substance under the carriage to take hold of than in the bent cup; and its girder construction is far better suited to resist horizontal thrust—for, after all, it comes to this.

Speaking of the "little bit" theory, "Designer" fully exposes the folly of overstating one's case. When I read the letter of "Engineer and Contractor," I was astonished to find such a statement as that the cup of the Sydney gasholder consisted of 16 pieces only. There are 22 pieces of channel iron in the circumference of the cup, having 132 plates on one edge and 44 on the other. Surely "Engineer and Contractor" must be aware that what is technically known as the "cup" embraces the plates adjoining the channel iron, as well as the channel iron itself. What "Engineer and Contractor" probably means is this—that you can get a perfectly true and complete circle of channel iron (as a foundation to work upon, as it were) with less pieces, and less liability to twist out of shape in putting together, either in the yard or in erection, than with the bent cup, where you have a lot of heavy pieces to handle and put together at once. This he might fairly contend; but why did he not say so?

I cannot see how "Designer" can call the bent cup a "*tubular distribution of material*." If it is so, the square or channel cup is a "box girder," which is admittedly the strongest form of tube, especially as in this case its parts (flanges, webs, &c.) *break joint;* whereas the chief defect of the bent or "tubular" cup is that the joints *completely slice through the entire cross section of the "tube"*—thereby making it depend entirely upon the *riveted joints*, in which "Designer" seems to put so very little confidence.

In reference to the concluding paragraph of "Designer's" letter, anyone who prefers channel cups might very well retort that "Designer" does not know how to make one; he evidently knows but little about bending channel iron for cups. This sort of argument stands for very little indeed.

Undoubtedly, good sound cups can be made, and are made, of either form—"curved" or "square." Both have their advantages and disadvantages; both have their advocates. Contractors differ between themselves on this and other questions of construction; but there can be no possible harm in their stating why they prefer one form to another, as long as they avoid personalities. Even designers and consulting engineers cannot wisely despise the experience which is to be obtained only by perpetual contact with, and the actual *making*, erection, and repair of hundreds of gasholders, extending over many years. Surely the makers of gasholders must know something about the economics of gasholder construction.

THE WRITER OF THE SYDNEY GASHOLDER ARTICLES.

March 28, 1889.

COUNTY AUTHORITIES AND THE USE OF THE STEAM ROLLER.

SIR,—Will you kindly permit me to ask your readers for an answer to another question bearing on the damage done to gas-mains by the use of a steam-roller?

My case is as follows:—A gas-main passes over a bridge, constructed many years ago by the owners of a mill, over a stream diverted by them from a main stream, for the purpose of driving a water-wheel. The covering over the pipes is only about 10 or 12 inches thick; but for many years it has been sufficient to protect them from injury by any ordinary traffic. Recently, however, the County Authority have introduced a steam-roller, with the result that the pipe crossing immediately over the crown of the arch was snapped in two, and a considerable quantity of gas escaped before the defect could be remedied. I should say that the pipe was laid as low as it was possible to lay it; in fact, bearing directly on the masonry of the bridge. I might further add that the Road Authority refuse to have anything whatever to do with the bridge or the road immediately over it, though they have raised the road on each side and "metalled" it; also that the mill firm referred to now repudiate any ownership over the bridge.

My questions are, Are we entitled to recompense for loss of gas and damage done to pipes; and whom should we hold liable?

If any of your readers would give me an opinion on the matter, I should take it very kindly.

REGANAM.

March 28, 1889.

THE DINSMORE GAS PROCESS.

SIR,—If Mr. Valon will refer to my letter in your issue of March 19, he will find that I admit the anomaly he unnecessarily reiterates; and further that I promise, when prepared, to place the result of my investigations before your readers.

This plant is, I understand, now being erected at a number of other works, so that additional particulars of results may shortly be expected.

Widnes, March 29, 1889. ISAAC CARR.

SIR,—The Dinsmore process, for providing a good and cheap gas, seems to be somewhat to the fore at present. It may be but a flash—lighting up the gas firmament for a time, and as suddenly receding into utter darkness, like many another—or it may be something more. Whatever place this gas is destined to take, it is at present young; and common place or ordinary questions can be asked. A few simple ones occur to me as follows:—

1. What photometer is used at Widnes?
2. What burner is used for testing the illuminating power of the Dinsmore gas?
3. What burner is used for testing the illuminating power of the gas ordinarily supplied to Widnes?
4. What standard is applied against the gas to prove the illuminating power produced by the Dinsmore plant?
5. What standard is applied against the gas supplied to Widnes?
6. What is the weekly average, during the past two months, of the observed illuminating power, and the values after correction for temperature and pressure?

I think if these questions are satisfactorily answered by Mr. CARR, it will assist managers in forming their opinion.

March 30, 1889. MOREDIUS.

THE RELATIONS OF GAS COMPANIES AND CONSUMERS.

SIR,—I beg to thank you for pointing out, in your editorial remarks, an error which had inadvertently escaped my notice in my communication on the above subject in the JOURNAL for the 19th inst. My meaning was, however, so obvious, that doubtless your readers would not thereby be misled.

With regard to your criticisms, to which I purpose replying on some future occasion, I would merely remark that if "the essential motive of the sliding scale" is "curiously ignored" by me, it is certainly in a negative way; the scope of the paper not calling for any enlargements upon the advantages of this or the other arrangement for dividing profits between consumer and producer. Your quotation from the old German song may also, I think, be said to indicate the advantage of avoiding extremes in order to take a middle course; and the "self-interest of gas companies," while being an incentive to the cheapening of the gas supply (as you suggest), will therefore be best considered by a broad policy which shall place its affairs on a sound financial basis.

March 23, 1889. WANDERER.

P.S.—I may take this opportunity of pointing out to your readers that the word "months," in the fourth line of the second column on p. 530, should be omitted.

THE GAS REFEREES' NOTIFICATION.

SIR,—I am pleased to find that the Gas Referees, in their "Notification" just issued, have given a little more attention to the standard candles, doubtless with a view to making the mode of using them more uniform in the several testing-places under their jurisdiction. I suggested this course in my letter to you on the 27th of July, 1888; and it would have been better had it been taken years ago. It is now ordered that the candles should be so placed that the plane of the curvature of one wick shall be perpendicular to the plane of the curvature of the other wick. This, I think, is not sufficiently definite, as one test could be taken with the tip of the wick of one candle pointing to the disc, and another in the opposite direction; so that the centre of the candle flame in the one case would be in front, and the other behind the pointer—making an appreciable difference in the results of the two tests.

I think it would materially conduce to the end in view if the Referees would further order that no test should be taken with candles that had not previously been burnt until the tips of the wicks glowed, and then extinguished and allowed to cool two or three times, as, in my experience, it is the first two tests taken with a fresh candle that show the discrepancies which have brought discredit on the sperm candle as a standard of light.

Poplar, E., March 30, 1889. W. C. YOUNG.

COUNTY AUTHORITIES AND THE LAYING OF MAINS ON BRIDGES.

SIR,—In answer to your correspondent who wrote on the above subject last week over a Welsh signature, I think that county authorities have undoubted right to regulate and control all pipes (gas or water) sought to be laid over county bridges. The safety of the public requires that it should be so. Your correspondent, according to his own showing, adopted a most imprudent course in laying large pipes on the top of the iron floor of a bridge, where it would be impossible to find sufficient cover for them. The fact that pipes were laid along the old bridge, where there was ample cover, had nothing to do with the matter. They were there simply on sufferance, and subject to exigencies such as your correspondent describes as having actually occurred in this case. In my opinion, the proper place for pipes on an iron bridge is underneath, suspended to the cross girders. This is the usual course, and your correspondent will be wise if he accepts the inevitable.

Newport, Mon., March 28, 1889. GAS AND WATER.

THE PROPOSED COAL COMBINATION.

SIR,—If coal-owners desired to cut their own throats, I apprehend that they could not set about it more effectually than by forming the proposed gigantic "coal ring" alluded to in your last issue. They have two formidable foes (independently of the enormous risks, responsibilities, and contingencies surrounding such a scheme)—electricity and oil—to compete with, both of which are making considerable headway. The gas companies are not only competing with these as suppliers of light, but are competing for the supply of gas for cooking and heating purposes. To develop and secure such a business would enable the companies to charge less for gas in competition with electricity or oil used for lighting purposes. All this progress in favour of coal consumption would be thrown out of gear by the combination. Again, the largest industrial works in the country depend upon a reasonably cheap supply of coals. A rise in price would cripple, if not destroy, such industries, and drive them to other countries. The eventual loss to the coal-owners from these sources would be incalculable. Whatever immediate profit-result might be obtained, it would be under enormous risks, and attended most probably (considering the tremendous size of the financing speculation) with the usual collapse.

March 25, 1889. ANTI-MONOPOLIST.

THE OIL LIGHTING AT ERITH.

SIR,—In your issue of the 26th inst, in an article headed "Oil Lighting at Erith," you state that the oil-lamps, according to the official report of the Erith Local Board, have failed to the number of 292 during this winter. Permit me to say that this is a gross misstatement, and likely to prejudice us. As an absolute fact, during the winter three months—from Oct. 21 to Jan. 21—the number of lamps that were lit amounted to 24,570, being 270 lamps per night for a period of 13 weeks; and, in spite of all the gales and snowstorms, the total number of lamps found out at any time during the whole of this period was 92.

Holborn Viaduct, E.C., March 29, 1889. W. C. DEFRIES.

[The statement to which our correspondent calls attention was, as will be seen on reference to the paragraph containing it, not ours, but was made by Mr. R. P. Keys, in a letter to the *Bexley Heath and Erith Observer* for the 23rd ult., from which we quoted it.—ED. J.G.L.]

TYNEMOUTH GAS COMPANY.—The annual general meeting of this Company was held on Monday last week—Mr. John Moffat (Acting Chairman since the death of Mr. G. Clough) presiding. The report of the Directors, of which an abstract was given in the JOURNAL for the 19th ult., having been read by the Secretary (Mr. W. B. Davidson), the Chairman moved its adoption, and the motion was unanimously carried. A dividend of 5 per cent. on the original, and 3½ per cent. on the new stock, was then declared for the latter half of the past year; and an advance of £100 per annum was made in the salary of the Secretary, who has been with the Company for 35 years. The proceedings closed with the customary vote of thanks to the Chairman.

PENRITH LOCAL BOARD GAS-WORKS.—The annual report of the Manager of the Penrith Local Board Gas-Works (Mr. E. Shaul) shows that the total amount of gas made during the past year was 25,356,030 cubic feet, as compared with 24,212,970 feet in 1887, and that 2457 tons of coal were carbonized, at an average cost of 12s. 2½d. per ton, as compared with 2333 tons, at a cost of 12s. 8d. per ton in 1887. The gas sold amounted to 25,363,730 cubic feet; and 2,343,630 feet were unaccounted for, as against 2,171,800 feet in 1887, when the total amount sold was 24,198,600 cubic feet. The increase in consumption might, he thought, be attributed to the more general use of gas for cooking and heating, induced by the reduction of the price of gas to 2s. 10d. per 1000 cubic feet.

HEYWOOD CORPORATION BILL.—This Bill, in which, *inter alia*, the promoters ask for an extension of the period limited by the Act of 1877 for the construction of water-works, and powers to enable them to make bye-laws for insuring efficient service-pipes to houses, and to borrow £25,000 and such further sums as might be necessary—was before the Select Committee of the House of Commons on Police and Sanitary Regulations last Tuesday. Mr. Pritchard, the Parliamentary Agent, appeared for the Corporation; and there was practically no opposition. Mr. J. Diggle, the Water Engineer of the Corporation, stated that the necessity of the proposed extension of the time for ten years for the construction of the Ashworth Moor reservoir had arisen in consequence of difficulties in carrying out other portions of the scheme authorized by the Act of 1877. They had a sufficient supply for present requirements; but it was not large enough having regard to the continued increase of population. The estimated cost of the whole scheme was £50,000; but the £25,000 to be raised immediately was for increasing the storeage. The Chairman (Mr. G. W. Hastings) asked what was meant in the Bill by the extinguishing of the annuities. Mr. Pritchard explained that when the water-works were first purchased, the payment was by perpetual annuities. The Corporation now proposed to insert a clause to enable them to purchase, at the end of 60 years as regarded gas and 80 years in respect to water, at 25 years' purchase. The Chairman said the Committee had considered the Bill; and they would strike out of the preamble that portion which related to the extinction of the annuities. Subject to this, the preamble was proved. The clauses were then adjusted; and the Bill was ordered to proceed.

TORQUAY GAS COMPANY.—The Chairman of this Company (Mr. W. H. Kitson, J.P.) had good cause to congratulate the shareholders, at their annual meeting last Friday week, on the result of the past year's working. It had, he said, been one of the best year's the Company had ever had. The profits had been nearly £8000, against £5109 in the previous year. With regard to the reduction of the price of gas to 3s. 3d. per 1000 cubic feet, he had obtained a few figures from the last Board of Trade returns showing the price charged in various towns in the county. At St. Mary Church, it was 4s.; Teignmouth, 4s. 2d.; Barnstaple, 3s. 9d.; Devonport, 2s. 6d., and 2s. 4d. for the public lights; Exeter, 3s. 3d. and 3s.; Exmouth, 4s.; Ilfracombe, 4s. 2d.; Plymouth, 1s. 9d.; Sidmouth, 6s. 3d. So that, with the exception of Devonport and Plymouth, Torquay now occupied with Exeter, the third place. The maximum price they were allowed to charge was 5s. 6d. The receipts for the year on the sale of gas were £16,880, as against £15,575 last year—an increase of rather more than £1300. On the public lighting, it was a little less. From residual products, the receipts were £2918, against £2641; the improvement being more particularly in regard to coke and sulphate. As to the quality of the gas, the average for the year had been 16·31 candles. Prebendary Wolfe seconded the motion. Mr. H. Willey said he had lately paid a visit to the gas-works; and their condition reflected great credit on the Manager (Mr. R. Beynon). He further mentioned that a decrease had just been made in the price of gas at Exeter from 3s. 3d. to 3s. 2d. per 1000 cubic feet. The report was adopted; and the maximum dividends were declared. The Manager afterwards reported that the manufacture of gas had cost 10d. less per ton of coal carbonized than in the preceding year. The total quantity of gas made had been 114,800,000 cubic feet, against 110,300,000 feet; and the gas sold was 104,000,000 cubic feet, as against 97,000,000 feet. This showed that there had been a saving of 4,000,000 cubic feet in the leakage, which had been reduced to 9 per cent.

Parliamentary Intelligence.

HOUSE OF LORDS.

During the past week the following progress was made:—

Bill committed: Cleveland Water Bill.

Bills reported: Coventry Corporation Water Bill, Newcastle and Gateshead Water Bill, Padiham and Hapton Local Board Bill, Wakefield Corporation Bill.

Bills read the third time, and passed: Deanhead Commissioners' Bill, Yeadon Water Bill.

Opposition withdrawn: Manchester Corporation Bill, Windermere District Gas and Water Bill.

A petition in favour of the Rastrick Water Bill was presented from owners of property and ratepayers in Rastrick; and one against alteration in the Bill, from the Corporation of Halifax.

HOUSE OF COMMONS.

Monday, March 25.

The Examiners reported that the Standing Orders applicable to the Hythe Corporation Bill (Lords) had been complied with; and that in the case of the additional provision in the Woodhall Spa Company Bill, they had not been complied with.

BRIBERY (PUBLIC BODIES) BILL.

Lord R. Churchill moved the second reading of this Bill.

Commander Bethell expressed his inability to comprehend why public bodies only were dealt with in the measure, as they were quite as capable of taking care of themselves as private bodies, who were excluded from its operations. He thought legislation should be general.

Mr. Brunner was also of opinion that the scope of the Bill should be extended to private concerns, so as, if possible, to abolish the system of paying commissions, wherever it prevailed.

Lord R. Churchill thought there was a distinct difference between a public and a private body, and that it would be detrimental to the progress of the Bill this session if its scope were extended as suggested. At some future time Parliament might possibly deal with the mischievous practice of giving "tips" of all kinds; but this could not be done now. He had reason to know that the Bill, which was really the outcome of the Commission of Inquiry into the proceedings of the Metropolitan Board of Works, had the approval of a large number of public bodies; and correspondence which he had received in connection therewith showed that practices prevailed which it was the object of the Bill to prevent.

The Bill was then read a second time.

THE LONDON COAL AND WINE DUES.

Sir J. Pease asked whether, at a recent meeting of the London County Council, that body declared its opinion, by a majority of 76 votes to 34, that it was "inexpedient to renew the London Coal and Wine Duties Act," which expires in July, 1889; and whether Her Majesty's Government are still of opinion that the Act should not be renewed.

Mr. W. H. Smith: The Government adhere to the view they have repeatedly expressed—that this is a question primarily for the decision of the Metropolis itself; and they will not, therefore, take any steps to bring about a renewal of the Act in question.

Thursday, March 28.

WEIGHTS AND MEASURES BILL.

This Bill was read a second time, and committed to the Standing Committee on Trade, &c.

Friday, March 29.

The report from the Standing Orders Committee in the case of the petition for a Bill by the Belgrano (Buenos Ayres) Gas Company, Limited, was read; and a Bill, to extend and vary the Company's powers, was ordered to be brought in by Sir R. Fowler and Colonel Laurie.

During the past week the following progress was made:—

Bill read the first time: Yeadon Water Bill.

Bills reported: Edinburgh and District Water Bill, Heywood Corporation Bill, London Hydraulic Power Company Bill, Morley Gas Bill, South Kent Water Bill.

Petitions withdrawn: East Kent Water Bill, by the Corporation of Sandwich; Kettering Water Bill, by W. R. Rose and C. H. Maunsell; Long Eaton and District Water Bill, by the Long Eaton Local Board; South Kent Water Bill, by the Maidstone Rural Sanitary Authority; Swansea Corporation Bill, by the Swansea Gaslight Company.

HOUSE OF LORDS COMMITTEES.

Tuesday, March 19.

(Before Earl Belmore, *Chairman; the Marquis of* Breadalbane, *and Lords* Wimborne, Hamilton of Dalzell, *and* De Ramsey.)

THE DEANHEAD COMMISSIONERS' WATER BILL.

This Bill, in which authority is sought by the Deanhead Commissioners, among other things, to construct certain works, and to supply water in bulk, came before their Lordships to-day.

Mr. Balfour Browne, Q.C., appeared for the promoters; and Mr. Worsley Taylor represented the Stainland Local Board, who opposed the Bill.

Mr. Balfour Browne said that the object of the promoters was very simple; and he did not think it would be necessary to occupy much time. Important industries were now being carried on in the district. The area, in fact, comprised three Local Board districts, which were thickly populated, and were in the summer months very badly off for water. It had occurred to the Deanhead Commissioners, who were practically the owners of the watershed, that water might be brought down from the Deanhead Reservoir to supply these three districts, and also the mills along the course of the stream for scouring and other purposes. That there was a large scarcity of water at the present time was apparent from reports of the Medical Officer of Health of the Stainland Local Board, who were the only opponents. The works necessary would be but very slight. With regard to the opposition of Stainland, the learned Counsel pointed out that it was not forced to take the water. Indeed, not one of the districts was compelled to take it. If they chose to have it, the price would be settled either by agreement or, in the event of disagreement, by arbitration. He argued that the allegations in the petition from Stainland gave the Local Authority no *locus standi;* and he alleged that one-half of the rateable value of Stainland was in favour of the Bill. The only objection which seemed to give Stainland a right to appear, was that the Deanhead Reservoir would intercept some of the water which would otherwise earlier reach the Black Brook; but the riparian owners on that brook who might be so affected were in favour of the Bill, and the promoters were limited in regard to the amount of water they could take. The allegations as to pollution had no force, because the promoters had already a right to use the brook water for their manufactures; and it was only a question how the water should first reach them. He submitted that decisions showed that where powers were merely permissive, and it was at the option of a local authority to accept or reject, that did not give *locus standi.* He should ask their Lordships to say that the Stainland Local Board were not in any way interested to oppose the Bill. If their Lordships decided against him he would go into the merits of the case.

Mr. Worsley Taylor submitted that on every ground the Stainland Local Board had a right to be represented. The very head and front of the Bill as it stood originally was to supply first and foremost the township which he now appeared for; and yet Mr. Balfour Browne maintained that Stainland was not entitled to say a word in opposition to the proposal. On the merits of the Bill, there was absolutely nothing to prevent the promoters from taking every single drop of water from the watershed—there was no limitation, no gauge, no compensation clause. It was a sham to say that the Deanhead Commissioners were promoting this Bill; it was really being promoted by the mill-owners in their individual capacity. The promoters were really coming before their Lordships to compete with his clients, who were the persons really charged with the duty of providing a water supply. The Local Board admitted that water was wanted; and they started a scheme before the present one. That scheme had been carefully got up; it was formally presented to the Local Government Board; an Inspector held an inquiry as recently as last month; and the Board were now awaiting the Inspector's report.

Mr. Balfour Browne denied that the object of the Bill was to supply Stainland, but "any local board district near the line of pipes that wants water."

Their Lordships, after a brief consultation, decided that the opponents had *locus standi.*

Mr. *J. Shaw,* Chairman of the Deanhead Commissioners, was called, and examined by Mr. Balfour Browne. He said the proposals embodied in the Bill would be conducive to the prosperity of the townships. A great many people in Stainland were of that opinion; and they represented more than half the rateable value.

Cross-examined, witness admitted that all the Commissioners were mill-owners and occupiers. Their idea in promoting the Bill was to supply water to riparian owners and such districts as required it. A Company was formed for the purpose of laying the pipes proposed under the Bill; but the money would be raised by the Commissioners themselves.

At this stage, on the application of Mr. Worsley Taylor,

Mr. *Marshall,* Clerk to the Deanhead Commissioners, was called to depose to circumstances under which a certain agreement was drawn up. The Stainland Local Board asked for a supply of water in February last year. The Deanhead Commissioners offered it at 3d. per 1000 gallons at the reservoir, provided the Local Board would lay the necessary pipes. The offer was not accepted. Afterwards the Commissioners formed a Company to undertake the laying of the pipes, as the Board of Commissioners in their corporate capacity had no power to raise the money for the purpose. If the Bill passed, the Commissioners would have power.

Some discussion ensued as to the quantity of water to be abstracted from the stream; and an amicable understanding was arrived at.

Mr. Worsley Taylor then raised the question of the insertion of a clause providing for the quality of the water.

After some conversation, it was agreed that the following clause should be inserted:—"Nothing in this Act shall prevent the Stainland Local Board from obtaining a supply of water themselves, or from any person, corporation, or company within or without their own district, or from exercising any of the powers, rights, and privileges relating to water supply conferred on them by the Public Health Act, 1875, or any Act amending the same."

Mr. Worsley Taylor then asked for the provision of a penalty, a proper gauge, and an inspection clause.

Mr. Balfour Browne objected to the application.

After a brief consultation, the Committee expressed their opinion that it was not expedient such a clause should be inserted.

The preamble of the Bill was then declared proved; and their Lordships proceeded with the clauses.

Thursday, March 21.

WAKEFIELD CORPORATION WATER BILL.

This Bill came before the Committee to-day.

Mr. Balfour Browne, Q.C., and Mr. Cripps appeared for the Corporation; Mr. Pember, Q.C., and Mr. Worsley Taylor represented certain opposing mill-owners.

Mr. Balfour Browne briefly stated the objects of the Bill, which were to empower the Corporation to construct additional works, to extend the time named for completing the works specified in the Act of 1880, to vary the conditions as to compensation, and to raise £170,000 by loan.

Friday, March 22.

Mr. Balfour Browne, resuming his speech this morning, said the Corporation proposed to add 186 acres to the drainage area, and to give 9 inches compensation water to the mill-owners, just as they had under the Act of 1880. He pointed out that in 1875 Bradford wanted to construct additional reservoirs, and were allowed to do so without further compensation. The present petitioners suggested that danger would result from the construction of the Booth Dean reservoir. Under Section 29 of the Act of 1880, the Corporation purchased the entire watershed, and were entitled to take the whole of the water falling on that area; and, but for the excessive compensation which was given to the mill-owners, the Corporation would have been able to utilize most of that water by their existing works. They had, however, to give a compensation of 9 inches, and store it over a long period for the benefit of the persons now opposing the Bill, and hence it became necessary to ask their Lordships to authorize the construction of the new reservoirs for storeage purposes. Wakefield could not afford to be rash, and to give away water which it had already purchased at the expenditure of £210,000; for it had nothing but a few valueless pipes, and was under a very heavy burden indeed.

Mr. *H. Rofe,* C.E., deposed that it was proposed to give up 83 acres and to take up 186; leaving a gain of 103 acres in respect of which the compensation water given would be 9 inches. The basis of compensation in regard to the new area was accordingly the same as the old. The proposed additions in works would be an advantage to the Wakefield supply, which was not confined to the city, but was spread over a large adjacent district. They would be able to give 600,000 gallons a day on the completion of the second part of the scheme; and it would be necessary to complete this second half in order to carry out the obligations to the adjacent district. The Corporation had burdened themselves heavily by purchasing the old undertaking.

In answer to Mr. Pember, witness said the present consumption was 1,600,000 gallons per diem in Wakefield and the outlying districts. The area would give 3,000,000 gallons per day; and by increased storeage, they would be able to tide over a drought of 200 days, which in this district was found to be necessary.

Mr. *T. Hawksley*, C.E., said it had been well settled that under ordinary circumstances one-third of the available rainfall was very ample compensation to mill-owners. In this particular case the additional evaporation from the water surface of the reservoir was not taken into account, whereas it ought to have been; so that the mill-owners obtained more water than they were entitled to.

Mr. PEMBER, for the petitioners, asked for compensation on the difference between 186 acres and 103 acres, and that the petitioners should have further compensation in respect of the new reservoirs and catchwaters in proportion to the increase of impounding power given over and above the impounding power of the works sanctioned by the 1880 Act.

The Committee here consulted in private; and on the public being admitted,

Lord BELMORE said: The Committee have considered these two points; and they have determined to grant the compensation asked for by the mill-owners in respect of the difference between 103 acres and 186 acres—that is, to grant 9 inches over the whole 186 acres, but to refuse anything further.

The preamble was declared proved; and their Lordships went through the clauses.

THURSDAY, MARCH 21.

(*Before Earl* STRAFFORD, *Chairman; the Marquis of* ABERCORN, *and Lords* DE ROS, POLTIMORE, *and* KENSINGTON.)

COVENTRY CORPORATION WATER BILL.

Mr. PEMBROKE STEPHENS, Q.C., appeared on behalf of the promoters; Mr. CRIPPS represented Mr. W. Alcock, of Teignmouth, Devon, who had petitioned against the Bill.

Mr. STEPHENS, in opening the case, said the Bill was promoted by the Corporation of Coventry. Although a town of considerable antiquity, Coventry was until recent times more or less stationary with regard to its population. Of late years, however, owing to the settlement there of an important industry—the manufacture of cycles—it had grown very largely. In fact, for something like 40 years the population only advanced from 31,000 to 42,000, at which figure it stood in 1881; but now, in 1889, it was calculated that it exceeded 50,000. The Corporation had therefore to make considerable additions to their former water supply. Some time ago they sank an artesian well which met an immediate want; but it was urgently necessary that some additional works should be carried out. Two or three years ago there was a dry summer, which compelled everybody to look into what water supply they had, and what they could rely on. The Corporation sought the advice of Mr. T. Hawksley on the matter; and he told them that they must apply for additional powers. These would be found contained in the clauses of the Bill before them. [The learned Counsel then reviewed briefly the provisions of the Bill.] Two petitions had been presented against the measure—one from the London and North-Western Railway Company, and the other from Mr. William Alcock. The Railway Company's matter, he was happy to say, had been arranged; the end sought by the Company having been accomplished to the mutual satisfaction of both parties. They had still, however, to deal with the other petitioner. As regarded the need for the water, and the propriety of having the larger supply which it was proposed to obtain by the Bill, he did not think it could be seriously disputed. The real question which arose was whether the petitioner had such an interest in the matter as to justify him, in accordance with parliamentary practice, in being heard against the Bill at all. He proposed to ask their Lordships to say that his learned friend had not. The petitioner, it appeared, had some property at Radford, near Coventry; and it was in respect thereof that the petition was presented. The first paragraph of the petition, stating that the proposed works were intended to be carried through and executed in different parts of the parish of Holy Trinity, near Radford, was in a sense inaccurate, because it gave the impression that the whole of the works were to be in that parish; but as a matter of fact they were not. There were two pumping-stations proposed—one being at a distance of three miles from the petitioner's property; but there was already a station within a mile, of which apparently he had no ground of complaint. The next part of the objection was that the land proposed to be taken for the water-works immediately adjoined the petitioner's property, and that upon this land there was a valuable spring supplying the water necessary for the use of the houses and land, which spring would be injuriously affected by the works and operations. As regarded the remainder of the petition, it was merely formal. The point for their Lordships' consideration was whether or not the petitioner had *locus standi* against the Bill. An owner of property had a right to have the water come to him undiminished in its flow and quantity by the acts of any adjoining owner, subject only to such reasonable use—the taking of water for his own purposes—as every owner had. Therefore if the Bill proposed to interfere with the stream or with the surface flow of water, the petitioner would have an undoubted right to be heard. When it came to a subterranean stream of water not flowing in any definite known channel, then another set of considerations arose. According to a well-known decision in their Lordships' House—the case of *Chasemore v. Richards*—underground water was not, like surface water, the subject of ownership and property. It was in its very nature a thing that could not be traced, and in respect of which they could not assert the same legal rights. Therefore, as far as he was aware, the apprehension that a stream of underground water was likely to be stopped did not give Mr. Alcock *locus standi*. Having cited other decisions in support of his contention, the learned Counsel proceeded to say that the matter might be reduced to a very short and simple issue. The lands upon which the Corporation were proposing to sink a well belonged to a private owner. Supposing that private owner, without an Act of Parliament, proceeded to sink a well on his land, thereby draining the well of his neighbour, what legal remedy would the neighbour have? None, because the underground water was as much one man's as another's. He would be told that his remedy was to get water by sinking his own well deeper; it did not involve any question of legal right. If that could be done by the owner of the land as it stood, in what different position was his friend to obtain compensation? Under these conditions, he submitted that if his friend succeeded in persuading their Lordships that he had a right to be heard, it would be a new departure in the practice of the House of Lords.

Mr. CRIPPS said he thought he should be able to convince their Lordships that he was entitled to be heard. He did not call in question the cases cited, but said they were not to the point. What would be done here would be to interfere with the petitioner's surface water—a spring of water which flowed upon his land; and this being so, he contended that he had *locus standi*. He then quoted the cases of the Corporation of Croydon Water Bill, the West Yorkshire Water Bill, and the Bristol Water Bill, where petitioners in respect of underground water were allowed *locus standi*, and also those of the Staffordshire Water Bill and the Hinckley Local Board Bill, in support of his contention. The more modern practice was not in accordance with that cited by his learned friend. So much hardship was felt in regard to some of the older decisions, that last year everybody was allowed to be heard against the Bristol Water Bill. He could put his Engineer in the box to show that there was a *primâ facie* case that the petitioner's springs would be exhausted by the proposed works.

Mr. STEPHENS having replied,

The Committee deliberated, and eventually allowed the petitioner's *locus standi*.

Mr. *T. Browett*, Town Clerk of Coventry, then gave evidence in support of the Bill. He said the Corporation already had powers of water supply, obtained in 1844. In addition to the works then authorized, they had, upon the advice of Mr. Hawksley, sunk an artesian well; but the Corporation had been advised that, having regard to the increasing population, they must provide additional means of water supply.

Mr. *T. Hawksley* said he had advised the Corporation in regard to their water supply for between 40 and 50 years. The present works were made for a population of a little more than 30,000. There were now 54,000 people; and the population was rapidly increasing. The time had come when it was absolutely necessary to extend the works, or rather to obtain water from other sources, because they had exhausted their means where the present works were situated. In the new works they proposed to sink a very considerable well for tapping the water which they knew to be found at a moderate depth. A boring had been made on the spot where it was proposed to put the new works, and the water boiled up through the tube to the surface of the ground to the extent of 80,000 gallons a day, although the hole was only 5 inches in diameter. So they knew perfectly well that they were assured of getting a large quantity of water. The level was considerably above that at which the water was now obtained, so that there would be greater pressure. One object of the Bill was to give a constant supply. As to the works themselves, one pumping-station would be about three miles from the petitioner's property; but the other would be near to it. The petitioner would, however, be within the limits of the Corporation, and would be entitled to a supply. The petitioner's statement as to his losing his water, owing to the contiguity of the pumping-station to his house, was merely an apprehension. There was nothing exceptional in this case. It was the ordinary property-owner living in the neighbourhood of water-works, and it was always to be apprehended that the water taken might be derived from the same source as the water which supplied the adjoining property.

In cross-examination by Mr. CRIPPS, witness said the Corporation certainly could not abandon the second pumping-station, as they would have to pump at both stations. His experience did not enable him to say whether or not the petitioner's springs would be affected; but if he was injured, the matter of compensation would be a question for their Lordships. He did not, however, believe petitioner would be affected.

Re-examined by Mr. STEPHENS, witness said that having regard to the levels of the two sources of supply, it would not be wise to abandon No. 2 station. The Corporation would undoubtedly want both in course of time. Which should be first used was a matter for the discretion of the Corporation. At the second station water was going to waste which could be utilized for the benefit of the town. The petitioner, he thought, could use 1000 gallons of water a day.

Mr. *Baldwin Latham*, M. Inst. C.E., examined by Mr. CRIPPS, said that in his opinion pumping at No. 2 station would constitute a serious injury to Mr. Alcock's property, as the springs would be affected.

Mr. *Alcock* was next called, and said the house was occupied on a 14 years' lease, four years of which were still to run; and it was used as a high school for the sons of Roman Catholic noblemen and gentry. The average number of boys in the house was about 40; and the requirements in regard to the water supply were abnormal.

Mr. CRIPPS then addressed their Lordships on the evidence, and said Mr. Hawksley had shown that there was no absolute necessity for the second pumping-station, although he was in favour of keeping both in the Bill. Coventry would, according to Mr. Hawksley's own showing, be amply supplied with water for the next 20 or 30 years by only one additional bore-hole. But assuming the other to be necessary, he asked their Lordships to consider what was the position of Mr. Alcock, whose property might, on Mr. Hawksley's admission, and most certainly would according to the evidence of Mr. Latham, be injuriously affected. If their Lordships thought the second bore-hole should be sanctioned, he suggested that Mr. Alcock should have proper compensation by a special clause dealing with the matter in the Bill. Such a clause would be to the advantage of the Corporation as well as of the petitioner.

Mr. STEPHENS called attention to the three compensation clauses in the General Act, which he said would be sufficient for all reasonable purposes.

After a short consultation,

The CHAIRMAN said the Committee were of opinion that the preamble of the Bill was proved; and if the petitioner found that he suffered any loss by the carrying out of the proposed works, he must apply for compensation in the usual manner under the Public Works Clauses Act, 1844.

The clauses of the Bill were gone through on the following day, and settled.

SOWERBY BRIDGE GAS SUPPLY.—The acquisition of the gas-works at Luddenden Foot has considerably increased the responsibilities, and entailed much additional labour and anxiety upon the authorities at Sowerby Bridge. Nevertheless, the movement for further extensions to Luddenden and Midgley goes on apace, cheerfully aided by Mr. J. Marsland, the Gas Manager; and a similar service to Barkisland is talked of. The initiative has been taken in each instance by consumers who themselves reside within the districts to be supplied. The Barkisland Board already possess an undertaking that the gas will be supplied to them on the condition that they shall lay the pipes from the main at Ripden—a distance of about a mile. They will discuss this offer at their next meeting.

THE TRIAL OF ELECTRIC LIGHTING AT READING.—The *Reading Mercury* for the 23rd ult. contained the following remarks on the subject of the electric lighting experiment, which, as stated in the JOURNAL last week, was started on the evening of the 16th ult.:—"The electric lamps burn with a steady light; but they do not appear of sufficient power for some spots. The lamp opposite the Municipal Buildings is hardly sufficient to light the open space near the Queen's statue, and the lamp in Broad Street does not compare at all favourably with the splendid new gas-lamp [of 500-candle actual power] which the Gas Company have erected in Broad Street. The two lamps in the Market Place, however, light that portion of the town well. Where reflectors have been put over the lamps, the effect has been improved. The Company professes to guard against the possibility of a town being placed in darkness when dependent upon the electric light for its illumination; but in some towns the light has not been at all successful. At Leamington the Corporation has given up electric lighting and gone back to gas lighting at an increased cost. We have no means of comparing the cost of the electric light with the cost of the large gas-lamps; but what the public will require, before adopting electric lighting, is that the system is to be depended upon."

Legal Intelligence.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

WEDNESDAY, MARCH 27.

(*Before Mr. Baron* HUDDLESTON *and a Special Jury.*)

UNGAR *v.* SUGG AND CO.

This was an action brought by Mr. Julius Ungar, a lamp manufacturer and gas engineer, under the 32nd section of the Patents, Designs, and Trade Marks Act, 1883—viz., "Where any person claiming to be the patentee of an invention, by circulars, advertisements, or otherwise, threatens any other person with any legal proceedings or liability in respect of any alleged manufacture, use, sale, or purchase of the invention, any person or persons aggrieved thereby may bring an action against him and may obtain an injunction against the continuance of such threats and may recover such damages as may have been sustained thereby, if the alleged manufacture, use, &c., is not an infringement of any legal rights of the person making such threats: Provided that such section shall not apply if the person making such threats with due diligence commences, &c., an action for infringement of his patent." The alleged threats in this case were made in the early part of 1887, and were proved by the production of correspondence and practically admitted, as also that the defendants had up to now taken no action to establish their patent. The matter arose shortly thus: Early in 1887 nine lamps were put up in front of a draper's shop in High Street, Clapham, owned by a Mr. Edwards, by his architect, Mr. Stevens. These lamps were made and supplied by Mr. Ungar. The plaintiff denied that the lamps were an infringement of Mr. Sugg's patent, as alleged, and claimed damages under the Act for loss of trade occasioned him in consequence of the defendants' complaints and threats to his customers for lamps. As the case originally opened, there were several issues involved, including the validity of the defendant's patent, and expert evidence was adduced upon the latter. It ultimately resolved itself, however, into one issue, which, with the substantial acquiescence of the defendants' Counsel, was put thus: Has the plaintiff produced to the Court the identical lamp which he put up for Mr. Edwards, or has that lamp since being examined by the defendants' representative in April, 1887, been altered? Because it is now admitted that the specimen lamp produced is not an infringement upon Sugg's patent. At the close of the evidence and Counsel's addresses,

His LORDSHIP summed up; and having reviewed the nature of the claim, said the real question was whether or not the lamps supplied by Ungar were substantially copies of Sugg's patent.

In the end the jury found a verdict for the plaintiff.

His LORDSHIP granted an injunction, and directed an inquiry as to damages.

[A more extended report of the case will appear next week.]

HALIFAX BOROUGH POLICE COURT.—TUESDAY, MARCH 26.

(*Before Mr.* J. W. WARD, *Chairman, and a Bench of Magistrates.*)

CHARGES OF ASSAULT ARISING OUT OF THE STRIKE AT THE GAS-WORKS.

To-day the Court was occupied for some time in hearing charges of assault brought against several of the men who have left the service of the Corporation by reason of the strike at the gas-works.

John M'Donald was charged with assaulting William Bradshaw, of Burnley, who had been employed as a stoker at the gas-works.

The TOWN CLERK (Mr. Keighley Walton) prosecuted; Mr. W. STOREY appeared for the prisoner.

William Bradshaw stated that, owing to illness, he obtained leave on the previous Wednesday (the 20th ult.) to return home; and in the afternoon of that day left the works in company with another man. When he reached the corner of the railway station yard, he was met by four men, whom he had noticed following him. The prisoner, who was one of the four, called him a "knobstick," "legged him," struck him on the side of the head, and kicked him. The prisoner then walked away. He had not given the men any provocation whatever. He handed in a doctor's certificate, showing that he had been unfit for employment since the assault, in consequence of the injuries received.

Detective-Inspector *Newburn* deposed to arresting the prisoner, who denied being there.

Mr. STOREY, for the defence, said his instructions were that the prisoner was at the time of the alleged occurrence, walking in an opposite direction altogether from that by which the prosecutor had come; and it was not possible, therefore, for M'Donald to have followed Bradshaw and his companion. He wished to say at the same time, with regard to the two or three cases of assaults alleged to have been committed, that the individuals who committed them did them contrary to the instructions of the others; and it was rather hard that blame should attach to a large body of men for such occurrences.

The BENCH held the charge proved.

A long list of convictions for previous offences against the prisoner having been read out by the Chief Constable, he was committed to prison for one month, with hard labour.

There were two other charges against the prisoner—one being of assaulting the new Superintendent; but the Town Clerk, expressing his gratification at Mr. Storey's statement on behalf of the body of men on strike, that they did not in any way countenance these acts of violence, said he would withdraw them.

Mr. STOREY thanked the Town Clerk for taking this course.

The CHAIRMAN, on behalf of the Bench, assenting, said he was sure, after what Mr. Storey had said, that the conduct complained of did not represent the feelings of the bulk of the men on strike, who were evidently seeking to obtain the ends they had in view by peaceful means.

William Grass and *William Henry Varnham*, both gas-works *employés* on strike, were charged, the former with assaulting Isaac Hanson, and the latter with assaulting William Cooper, on the afternoon of the 24th ult.

Complainants stated that they left the gas-works at 1.30 p.m. on the previous Sunday, and proceeded towards Salterhebble. They saw that four men were following them; and they called at the Stafford Arms public-house. No sooner were they seated, than the four men entered, two of whom were the prisoners; and they began to abuse them, called them "black sheep," "knobsticks," &c. Then the prisoners, taking complainants by the coat-collars, said, "You're wanted outside," and struck and kicked them.

The witnesses' statement having been corroborated,

The BENCH expressed the opinion that the assaults were of an unprovoked and deliberate character. Fines would not, they said, meet the requirements of the case, and each would be committed to prison for fourteen days, with hard labour.

William Walton, another stoker on strike, was charged with having assaulted John Robinson on the previous Saturday night. This matter was briefly mentioned in the JOURNAL last week (p. 589), and was of a more serious nature than the other charges. It appears that on the night in question Robinson, who was one of the new hands, left the gas-works accompanied by six or seven others. In passing through the town, they noticed that they were being followed by a group of men, among whom was the accused. According to the statement of one of the men who accompanied Robinson, when they reached the bottom of the Market, Walton tripped up Robinson, and, as the man was falling, dealt him a severe blow on the side of the face with his fist, causing him to fall with the back of his head against the pavement. Robinson was picked up in an insensible condition, and removed to the Infirmary, where his condition was regarded as very serious, it being thought that his skull was fractured.

The TOWN CLERK said, in view of the critical condition in which Robinson still lay, he must ask for a remand.

Mr. STOREY, whilst assenting to a remand, said he should be able to prove beyond the shadow of a doubt that the accused was not at the place at all. It was an undoubted case of mistaken identity, and, under these circumstances, he must press for bail.

The TOWN CLERK said he would leave the matter entirely in the hands of the Bench.

The Magistrates agreed to accept bail—the accused in £100, and four sureties of £25 each.

LIVERPOOL POLICE COURT.—FRIDAY, MARCH 22.

(*Before Sir* J. POOLE *and Mr.* G. HOLT.)

"ECONOMIZING" THE CONSUMPTION OF GAS.

Anne Olsen, refreshment-house keeper, of 13, Scotland Place, was to-day summoned for having, on March 16, "caused to be laid certain pipes communicating with a certain other pipe belonging to the Liverpool United Gas Company, without their consent;" and, on a second information, with having "improperly used or burned certain gas supplied by the said Company."

Mr. TARBET (who represented the Company) said defendant had made herself liable to a penalty of £5, and a further penalty of 40s. for every day the offence had been committed. This was an extremely bad case—in fact, the prosecution did not know whether they would not have been warranted in having the defendant arrested for stealing.

Mr. *J. B. Atkinson*, one of the Company's Inspectors, stated that, on March 16, he visited the defendant's house for the purpose of examining the meter. He found that the cellar-door was locked; but the door was opened by a servant—Mrs. Olsen being ill. Witness found the meter covered over with a sack; so that he at once guessed that something was wrong. On making an examination, he found that an india-rubber pipe had been inserted in the gas-pipe before it entered the meter; and through this the gas was conveyed into the pipe which supplied the house. By this means gas was obtained without passing through the meter.

Mr. *J. Grisenthwaite*, also an Inspector of the Company, gave corroborative evidence, adding that the meter had been removed 9 inches. No gas whatever was passing through the meter. Mrs. Olsen told him that a man had called, and undertaken to save the gas for her. There were 22 lights burning on the premises.

By the BENCH: None of the gas consumed passed through the meter. There were 13,300 cubic feet of gas burned during the past quarter, as compared with 21,200 feet in the corresponding quarter of last year.

Mr. ENTWISTLE, in defence, said that on the Thursday previous to the day with respect to which the defendant was summoned, a man called upon her, and offered for sale, for 25s., a gas "regulator" or "economizer"—evidently a most effectual one as applied to this meter. Mrs. Olsen said that she would not pay such a sum unless the apparatus was as economical as the man professed; and as she was herself an invalid, she would get a friend to inspect it, and see if it was a proper thing, and would save money. He called the following morning, and said that he had just removed a meter from a public-house; and he would let her have it for 3s. 6d., and charge £1 for fixing it. She paid him the 3s. 6d., saying that she would pay the sovereign when she saw how it worked. The next morning the gas officials called; and it was supposed that the man who sold the "economizer" called as well, and seeing that the gas was cut off, did not make application for the balance of money due to him. Mrs. Olsen was in bed at the time; and she had not the slightest idea that the Gas Company were being defrauded. The man told her that the "economizer" was a new invention, and she believed that it was all right. The reason that the cellar-door was locked was because fowls were kept there. Instead of having committed a fraud, she had herself been the victim of a fraud.

The BENCH said the defendant should have been more careful as to whom she allowed into the house to "economize" her consumption of gas, or for any other purpose. She must pay a fine of £5, and a further penalty on the second information of 40s. and costs. The total amount, with costs, was £7 4s. 6d.

BATH ELECTRIC LIGHT COMPANY, LIMITED.—This Company was registered last week, with a capital of £25,000, in £10 shares, to carry out a scheme of electric lighting on the Thomson-Houston system in Bath, and within a radius of five miles of the city.

REDUCTIONS IN PRICE.—The *Chelmsford Gas Company* have reduced the price of gas 2d. per 1000 cubic feet as from yesterday; thereby bringing the figure down to the lowest in Essex, with the single exception of Colchester.——As will be seen by an article in another column, the *Chorley Corporation* have made a reduction in the price of gas.

SALES OF SHARES.—Seven £10 "B" shares in the *Littleborough Gas Company* (on which £8 has been called up) were recently sold at Stalybridge at the high price of £20 each.——On Friday, the 22nd ult., Messrs. Hilliard and Son sold by auction some shares in the *Chelmsford and Maldon Gas Companies*. The £25 original shares in the former Company fetched from £43 10s. to £45 each; and three new shares of similar value realized £94. Three £27 original shares in the latter Company, bearing a dividend of about 9 per cent., sold for £121 10s. the lot.——Five £10 shares in the *Solihull Gas Company* realized, at a sale last Tuesday, £16 each. The dividend paid by the Company last year was 6 per cent.——Last Thursday a number of shares in the *Eastbourne Gas Company* were sold by auction; "A" and "C" shares (£10 paid) fetching £26 7s. 6d. to £26 12s. 6d., and "B" shares £19. The former pay 12½ per cent., and the latter 9½.——Last Wednesday, 79 *Bolton Corporation* gas annuities of £1 1s. 5½d fetched £32 3s. 9d. each, whilst 50 of the same, of £1 13s. each, realized £49 10s. 7d.——At the Queen's Hotel, Farnworth, last Thursday, Messrs. Hayhurst and Taylor disposed of two lots of £50 each of "A" stock in the *Farnworth and Kearsley Gas Company*. The stock is paying 10 per cent., and was sold for £238 per £100. On the same occasion 25 lots of £50 each "B" stock in the same Company, paying 7 per cent., sold for £162 per £100.——At a sale by auction at Maidstone on the same day, 63 £5 shares in the *Sutton Valence Gas Company* realized from £5 10s. to £5 15s. per share. Two debenture bonds for £250 and £100 respectively in the same Company were sold for £268 and £111.——At the same sale, 120 shares in the *Maidstone Water Company* realized £16 5s. each. Last Thursday, 108 ordinary shares (£10 paid up) in the *Kendal Gas and Water Company* were sold for £2153, or a very little under £20 per share.

Miscellaneous News.

COMMERCIAL GAS COMPANY.

The following is the report of the Directors of this Company, which, with the accounts for the half year ending Dec. 31 last (the principal portions of which are given below), will be presented at the ordinary general meeting of the proprietors to be held on Friday next:—

The revenue account shows a net profit for the half year of £57,034 14s. 3d.; making, with £1219 18s. 6d. received for interest, £58,254 12s. 9d. This, added to the amount brought forward from previous half years, makes £108,020 1s. 2d. Deducting therefrom £2727 15s. 4d. for interest on debenture stock, there remains standing to the credit of the net revenue account a balance of £105,292 5s. 10d., of which, having regard to the sliding scale and the price of gas charged during the half year, £44,800 is available for dividend. The Directors recommend the payment of dividends at the rates of £13 15s. per cent. per annum upon the old stock of the Company, and of £10 15s. per cent. per annum upon the new stock, both less income-tax. The balance of the net revenue, £60,492 5s. 10d., will be carried forward to the next half year. The Directors have resolved to reduce the price of gas from 2s. 6d. to 2s. 4d. per 1000 cubic feet as from the Lady-day quarter. The Directors have to report with the deepest regret the death of their esteemed and valued Chairman, Mr. Richard Bradshaw. They have elected Mr. William Graham Bradshaw to the seat at the Board vacated by the death of Mr. G. Thomas, and have elected Mr. Thomas Bevan to the seat vacated by the death of Mr. R. Bradshaw.

The following Directors—Messrs. Thomas Wrake Ratcliffe and Thomas Morrison Fairclough—retire by rotation; and, being eligible, offer themselves for re-election. Mr. George Ilsley, one of the Auditors, will go out of office by rotation; and, being eligible, offers himself for re-election. The Directors have to report with regret the death of Mr. Charles Thomas Blackman, one of the Company's Auditors. Mr. George Ennis and Mr. Augustus George Hounsham, duly qualified proprietors, have given notice of their intention to offer themselves for election to supply the vacancy thus caused. The Directors have pleasure in recommending that the remuneration of the Secretary be increased by £100 per annum; and they will propose a resolution to that effect.

The accounts accompanying the report consist of the usual statements. The statement of the capital stock (No. 1) stands as on June 30 last—viz., £680,000 paid up, out of a total of £880,000 authorized. The statement of loan capital (No. 2) shows that a sum of £129,890 has been borrowed out of £300,000 authorized—an increase of £8656 as compared with June 30 last. The total capital called up at the end of the past year was therefore £809,890. The capital account (No. 3) show a total expenditure of £810,553 4s. 11d., of which £2454 6s. 10d. was laid out on new works, mains and services, meters, and stoves in the six months covered by the report. The receipts were increased by the £8656 of debenture stock already mentioned, the premiums on which were applied to new works. By this additional capital, the overdraft standing on June 30 last has been cleared off; and there is a balance of £1491 15s. 11d. in hand. The remaining statements are as follows:—

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—				By Sale of gas—		
Coals, including dues, carriage, unloading, and trimming (see account No. 8)		£59,470 10 4		Common gas, per meter, at 2s. 6d. per 1000 cubic feet		£110,617 11 8
Salaries of Engineers, Superintendents, and other Officers at works		1,951 9 2		Public lighting and under contracts, common gas		8,820 12 8
Wages (carbonizing)		14,007 16 10		(See statement No. 10.)		£119,438 8 11
Purification, including £1283 16s. 9d. for labour.		3,016 6 4		Meter-rental	£2,296 18 10	
Repairs and maintenance of plant and works, materials and labour (less £126 8s. 7d. received for old materials)		8,893 6 3		Stove-rental	433 4 4	
Distribution of gas—		£87,369 8 11				2,730 3 2
Salaries and wages of Officers (including Rental Clerks)	£2,246 1 4			Residual products—		
Repairs, maintenance, and renewals of mains, service-pipes, and fittings, including labour	2,232 10 9			Coke, less £2631 12s. 3d. for labour	£25,241 18 4	
Repairs and renewals of meters and stoves	1,657 11 0			Breeze, less £239 1s. 9d. for labour	420 6 10	
		6,136 3 1		Tar	6,422 10 7	
Public lamps—				Ammoniacal liquor and sulphate	9,731 12 8	
Lighting and repairing		2,080 9				41,816 8 5
Rent, rates, and taxes		4,997 5 10		Miscellaneous receipts—		
Management—				Rents	£344 9 5	
Directors' allowance	£1,250 0 0			Transfer fees	23 12 6	
Company's Auditors	75 0 0					368 1 11
Salaries of Secretary, Accountant, and Clerks	1,089 9 6					
Collectors' salaries and commission	1,588 1 0					
Stationery and printing	381 5 5					
General charges	446 3 2					
		4,729 19 1				
Bad debts		851 19 2				
Law and Parliamentary charges		162 19 7				
Superannuations		907 2 8				
Official officers		82 17 1				
		£107,318 3 2				
Balance carried to profit and loss, net revenue account (No. 5)		57,034 14 3				
		£164,352 17 5				£164,352 17 5

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on debenture stock	£2,727 15 4	Balance, June 30, 1888	£94,565 8 5
Balance available for dividend, carried to balance-sheet	105,292 5 10	Less amount of dividend paid for half year ending June 30, 1888	44,800 0 0
			£49,765 8 5
		Balance from revenue account (No. 4)	57,034 14 3
		Dividends and interest	1,219 18 6
	£108,020 1 2		£108,020 1 2

No. 6.—RESERVE FUND.

Balance on Dec. 31, 1888	£44,379 5 1	Balance on June 30, 1888	£44,379 5 1
	£44,379 5 1		£44,379 5 1

No. 7.—INSURANCE FUND.

Balance on Dec. 31, 1888	£34,000 0 0	Balance on June 30, 1888	£34,000 0 0
	£34,000 0 0		£34,000 0 0

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1888.	Received during the Half Year.	Carbonized during the Half Year.	In Store, Dec. 31, 1888.
	Tons.	Tons.	Tons.	Tons.
Common	21,809	90,844	95,538	17,115
Cannel	2,674	2,682	3,891	1,465
	24,483	93,526	99,429	18,580

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, June 30, 1888.	Made during the Half Year.	Used during the Half Year.	Sold during the Half Year.	In Store, Dec. 31, 1888.
Coke—chaldrons of 36 bushels*	133	129,978	34,075	81,724	13,712
Breeze do. do.	133	10,069	—	8,594	1,608
Tar—gallons	163,400	1,018,604	—	936,804	245,200
Ammon. liq.—butts of 108 gals.	4,801	35,461	34,089	—	5,723
Sulphate of Ammonia—tons	485[10]	1,078[5]	—	1,400[6]	163[9]

* Under "Weights and Measures Act, 1878."

No. 10.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity Made. Meter Register.	Quantity Sold. Public Lights and under Contracts (estimated).	Quantity Sold. Private Lights (per Meter).	Quantity Sold. Total Quantity Sold.	Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lights.
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	1,011,281	55,621	884,941	940,562	11,124	951,686	59,595	5,092

BALANCE-SHEET.

To Capital—		By Cash at Bankers	£17,984 6 9
For balance, per account No. 3	£1,491 15 11	Cash in hand for current expenditure	1,700 0 0
Net Revenue—		Amount invested in Consols	78,379 5 1
For balance, per account No. 5	105,292 5 10	Stores in hand—	
Reserve Fund—		Coals	£11,709 10 0
For balance, per account No. 6	44,379 5 1	Coke and breeze	3,488 6 0
Insurance Fund—		Ammoniacal liquor and tar	5,031 11 3
For balance, per account No. 7	34,000 0 0	Sundries	5,776 17 3
Unclaimed dividends	1,743 9 1		26,006 4 6
Deposits	8,846 1 9	Accounts due to the Company—	
Interest on debenture stock	164 8 2	Gas-rental, quarter ending Dec. 31, 1888	£74,006 17 9
Sundry tradesmen and others, for amount due for coals, stores, and sundries	12,890 11 4	Arrears outstanding	1,462 12 11
			75,469 10 8
		For coke and other residual products	£8,149 7 0
		Sundries	619 3 2
			8,768 10 2
	£208,307 17 2		£208,307 17 2

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The report of the Directors of this Company which was presented at the half-yearly general meeting of shareholders last Saturday, showed that the revenue for the six months ending Dec. 31, 1888, inclusive of the interest on the reserve fund, amounted to £122,776. The expenditure, inclusive of interest on the debenture stock, being £86,391, there was left a balance of £36,385; being the net earnings in the above-mentioned period. To this there was added £2435 brought from the previous account; making £38,820 available for division among the proprietors. The Directors recommended the payment of dividends at the rates of 10½ and 7½ per cent. per annum on the respective shares, which would absorb £34,725, and leave £4095 to be carried forward. The accounts accompanying the report showed that the receipts from the sale of gas amounted to £97,123; those from the sale of residual products to £21,259; meter-rents were £2881; and the total revenue, £121,525. The receipts for gas were decreased by £4537, as compared with the second half of the year 1887, due to a reduction of 2d. per 1000 cubic feet in the price of gas. On the other hand, there was an increase of £2668 in the receipts for residuals. The expenditure on the manufacture of gas came to £62,592 (£47,406 being for coals); on its distribution, to £6490; the expenses of management were £4611; and the total expenditure, £81,686—leaving £39,838 to be carried to the profit and loss account. The quantity of coal carbonized was 59,774 tons; the bulk of gas made being 621,745,000 cubic feet. The residuals were: Coke, 71,052 chaldrons; breeze, 1880 chaldrons; tar, 769,421 gallons; ammoniacal liquor, 1,524,158 gallons. The Directors reported a final settlement in the case of Messrs. Bethell and Co., tar distillers, in liquidation. The sum due to the Company at the time of the failure of that firm amounted to £3531, out of which only £564 was lost.

HARROW DISTRICT GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Public Hall, Harrow, on Monday last week—Mr. JAMES GLAISHER, F.R.S., in the chair.

The ENGINEER and SECRETARY (Mr. J. L. Chapman, Assoc. M. Inst. C.E.) having read the notice convening the meeting, the report of the Directors, an abstract of which appeared in the JOURNAL for the 12th ult., was presented.

The CHAIRMAN, in moving the adoption of the report, said the shareholders must consider the balance-sheet satisfactory on comparing it with that for the preceding half year, especially taking into consideration that it was based upon a reduction of 3d. per 1000 cubic feet in the price of gas. On looking at the revenue, they would see that it was within £1 of what it was in the corresponding half of the preceding year. In the six months ending December, 1887, it was £3654 19s.; whilst in the past half year it was £3653 19s. Considering the reduction, however, it was very satisfactory. With regard to the residuals, they were £154 better; and this was a considerable advance. The increase in the consumption had been 754,000 cubic feet; and, taking the two items together, the shareholders would see the reason for the second paragraph in the report:—"In consequence of the satisfactory increase in the consumption of gas and the advanced price obtained for residual products, the Directors have been enabled to announce a further reduction in the price of gas from Lady-day of 3d. per 1000 cubic feet." They would be thus reducing their price to 4s. 6d. per 1000 cubic feet; and this placed them in a very favourable position in respect to other Suburban Gas Companies, which had more "go" in them. It was their hope to bring the figure down to 4s.; and then they would compare well with the London Companies, who had greater facilities for getting their coal. This must be taken into consideration. Doubtless some of the shareholders would think of certain remarks he made a few years since, when he said that it was a kind of unwritten law that they were not to take another ½ per cent. without the consumers having some benefit. Now the consumers were going to have an advantage without any increase in the dividend; but he hoped the shareholders would think the Directors had acted for the best. The shareholders' advantage was only deferred. An increase in the consumption of gas would be a blessing to the neighbourhood. A good piece of work had been done since their last meeting, in the lighting of the portion of road between Sudbury and Stonebridge Park. They had laid about 1½ miles of main; and now for the first time anyone could come from London to Harrow and have a light all the way. He thought it was a great thing that Harrow should have all her approaches well illuminated. Then if they looked at the works they found everything in capital order. From all the evidence given to him during the year, he found that the gas had never been below the parliamentary standard. It had generally been above 16 candles, and so far he thought it must be satisfactory to the consumers at large.

The DEPUTY-CHAIRMAN (Mr. John Chapman), in seconding the motion, said he agreed with all that the Chairman had said. Harrow was increasing; and he believed that it would soon look the cheerful town it was a few years ago. He trusted that the consumers appreciated the reduction they had made in the price of gas. It was the right thing to do; and he believed the Company would have a prosperous future.

The motion was carried unanimously.

Dividends were then declared of 7½ per cent. on the original "A" capital, 7 per cent. on the first additional "B" capital, and 5½ per cent. on the second additional "C" capital, all less income-tax.

The retiring Director (Mr. A. H. Baynes, F.R.A.S.) and Auditor (Mr. J. Randall) were next re-elected; and they briefly returned thanks.

Mr. C. HORSLEY, J.P., said it was usual, when they had a good balance-sheet, to propose a vote of thanks to the gentleman who was the means of their obtaining such satisfactory results. Mr. James Chapman had been anxious for some time to reduce the price of gas; and he (Mr. Horsley) must give him credit for bringing the matter prominently forward. He assured the Directors that if the price was reduced the shareholders should not suffer. The leakage last year was brought down very low, and that was a good thing for the Company. He was certain no one could give more time and energy to the work than Mr. Chapman had done; and he accordingly proposed that a vote of thanks should be accorded to him.

Mr. FENTON seconded the proposition, which was carried unanimously.

Mr. J. L. CHAPMAN, in responding, said it was a great satisfaction to him that the price of gas had been reduced, and yet they had received the same rental in return. He felt that with every reduction they made themselves stronger; and he believed that now they were getting a more satisfied body of consumers. His hearty efforts would still be with the Company; and he would do all he could to advance its interests.

A vote of thanks was then passed to the Directors, and the proceedings closed.

EXTENSIONS AT THE HALSTEAD (ESSEX) LOCAL BOARD WATER-WORKS.—Under the advice of their Consulting Engineer (Mr. Jabez Church, M. Inst. C.E.), the Halstead Local Board of Health have accepted the tenders of Messrs. Pudney and Son, of Colne Engaine, Essex, for £2863, for a water tower and engine and boiler house; and that of Messrs. F. Pearn and Co., of West Gorton, for £1950 for pumping machinery.

OTTOMAN GAS COMPANY, LIMITED.

The Ordinary Meeting of this Company was held last Tuesday, at the London Offices, 9, Queen Street Place—Mr. E. HORNER in the chair.

The SECRETARY (Mr. A. J. King) read the notice convening the meeting; and it was agreed to take as read the Directors' report and accounts for the half year ending Dec. 31, reference to which was made in the JOURNAL last week (p. 581).

The CHAIRMAN moved the adoption of the report; and, in doing so, said he should perhaps preface his remarks by saying that really the figures were so exceedingly similar to what they had had on other occasions that it was hardly necessary for him to go into them. The principal feature of the accounts was that the profit stood at such a sum that they were enabled to place £500 to reserve, which, the shareholders would agree, for a small Company, was not a bad thing, and he could not see why this should not continue in the future. For an Oriental Company, he thought the concern was well managed; seeing the difficulties they had to contend against. He ought to mention that they had now got the octroi duties and all the local taxes settled upon a proper footing, which was a very important thing indeed, and would free them from a great deal. With reference to the amount of coal carbonized and the make of gas per ton, the results were highly in favour of their Engineer (Mr. W. H. Andrews). The average quantity of gas produced per ton of coal was 10,593 cubic feet; and this he was sure the shareholders would regard as very satisfactory working. The unaccounted-for gas only amounted to 9·25 per cent. In every other respect the figures were, as he had already said, very similar to those in former accounts; and it would only be wasting the time of the proprietors to go through them.

Mr. A. J. DOVE seconded the motion.

Mr. RHODES observed that he could not see the words "reserve fund" in the accounts.

The SECRETARY said there was no reserve fund at present; and the £500 which it was proposed to carry to reserve would be the first entry.

The motion was unanimously carried.

The CHAIRMAN next moved—"That a dividend at the rate of 7 per cent. per annum, free of income-tax, on both classes of shares be and is hereby declared."

Mr. J. ORWELL PHILLIPS seconded the motion, which was agreed to.

Mr. DOVE proposed the re-election of the two retiring Directors (Mr. Horner and Mr. Phillips). Regarding the first-named gentleman, he had, as the shareholders all knew, been the life and soul of the Company since its commencement; and as to Mr. Phillips, he was the General Manager of the largest Gas Company in the world, and was a man of indomitable energy in all business matters.

Mr. RHODES seconded the proposition, which was carried.

Mr. HORATIO BROTHERS moved that Mr. T. Guyatt be elected to fill the vacancy in the auditorship caused by the death, in November last, of Mr. G. Allin. He could bear testimony to Mr. Guyatt's great ability, integrity, and honesty; and he was sure no better man could be appointed to the position.

Mr. W. H. HARDY seconded the motion; and it was unanimously carried.

The retiring Auditor (Mr. C. K. Butt) having been re-elected,

Mr. GUYATT briefly thanked the shareholders for appointing him an Auditor, and assured them that he should discharge the duties of the office to the best of his ability.

Votes of thanks were then passed to the Engineer and Secretary; the manner in which both gentlemen performed their work being highly spoken of by the proposers and seconders of the resolutions.

The usual acknowledgment of the services of the Chairman and Directors concluded the proceedings.

SHEPPY GAS COMPANY.

The Annual General Meeting of this Company was held on Wednesday, the 20th ult.—Mr. C. B. SHRUBSOLE in the chair.

The SECRETARY (Mr. A. W. Marks) read the Directors' report, an abstract of which appeared in the JOURNAL for the 19th ult.

The CHAIRMAN, in moving the adoption of the report, remarked that it was very satisfactory. In many districts a reduction in the price of gas was rapidly followed by increased consumption, so as to make scarcely any difference in the rental; but in Sheerness it advanced very slowly, and generally it took two years for the rental to reach the total at which it stood before the reduction was made. Still, it was satisfactory to find that the number of consumers was steadily increasing. Touching next upon the question of leakage, the Chairman remarked that the loss of gas from this cause varied from 7 to 15 per cent.; but he was glad to state that at Sheerness, owing to disused services being taken up, and leakage promptly stopped, the loss was only a little over 7 per cent., and he hoped that next year it would be even less. The works and plant had been kept in a thoroughly efficient condition, and nothing in the way of renewals would be required next year beyond a small outlay in the re-arrangement of valves at the works, so as to keep up a better pressure during the long winter evenings. Under a contract for three years, entered into in June last, the Directors would obtain a supply of the best coals at 8d. per ton less than was then paid. The wisdom of this measure was soon apparent; for since the contract had been entered into, coals had advanced in price. The price of coke was still very low; and if the Company could obtain another 3s. per chaldron—the price which was frequently realized by other companies—they would increase their income by £700 per annum. Last year, in anticipation of a loss on account of the reduction in the price of gas, they carried forward a sum of £223; and he was glad to say that, in order to pay the full dividends this year, they had only to encroach upon the amount for £21, leaving £202 to be carried forward. There was one other matter he must refer to, and that was the large amount the Company had to pay in rates—upwards of £400 per annum. It was thought by the Directors that this sum was excessive, and that an effort should be made to secure a reduction. This was a consumers' question, as the amount paid in rates did not affect the shareholders; and if they could get the assessment reduced, it would be a great advantage.

Mr. V. H. STALLON seconded the motion, and expressed his approval of the manner in which the Company's business was being conducted. Reference had been made to the lowness of the price of coke; and he wished to know whether the price received was not about the average of other companies.

The SECRETARY said the Companies at Rochester, Maidstone, Chatham, and Sittingbourne all obtained better prices for coke; and in some districts in other parts of the country, where coke was extensively used in gentlemen's conservatories, the prices were sufficient to pay for the coal carbonized. This was the case at Wokingham (one of those places which, much to the disgust of the inhabitants, had attempted to use oil in place of gas in the street lamps); but in that town, notwithstanding this favourable circumstance, the price charged for gas was 5s. per 1000 cubic feet. The Sheppy Company suffered in regard to coke through there being no manufactories in the neighbourhood which used it, like the

cement factories near Chatham, and the brickfields at Sittingbourne. He was of opinion that the Company was rated very high as compared with other companies; and he thought if the assessment was brought down to a fair sum, it would make rather more than 1d. per 1000 cubic feet less in the price of gas. This was a consumers' question, as they really had to pay the rates.

The motion was carried unanimously.

On the proposition of Mr. J. POOLE, seconded by Mr. GORDON, the dividends recommended in the report were unanimously declared.

The retiring Directors and Auditor having been re-elected, votes of thanks were passed to the Secretary and to the Manager (Mr. W. T. Carpenter), for the interest they had taken in the Company's affairs during the past year.

The proceedings closed with the customary compliment to the Chairman.

THE MANAGEMENT OF THE SALTLEY (BIRMINGHAM) GAS-WORKS.

REPORT OF THE GAS COMMITTEE.

The Gas Committee issued their report last week on the result of their investigation into the allegations made in regard to the administration of Mr. Henry Hack at the Saltley Gas-Works of the Birmingham Corporation on the occasion of the discussion by the Council of a proposal of the Committee to increase that gentleman's salary (*ante*, p. 400). This report —which will be presented to the Council to-day—as will be seen, entirely exonerates Mr. Hack from the charges made against him. It is as follows:—

When the last report of the Gas Committee was submitted to the Council, on the 19th of February, certain charges affecting the management of the Saltley works, and the conduct of Mr. Hack in particular, were brought forward by Councillors Bloor and Granger, with the result that the consideration of the proposed increase in Mr. Hack's salary was deferred. These charges were of so serious a nature—affecting not only the efficiency of the department, but the personal reputation of its officers —that the Committee deemed it their duty to institute a full inquiry into the whole matter, when every facility could be afforded for the full and free expression of complaints; and with this object they determined to ask Councillors Bloor and Granger to assist them by bringing forward as witnesses those upon whose complaints the charges were made. These gentlemen were accordingly invited to attend a meeting of the Gas Committee which was held on the 28th of February; the object being to formulate the specific charges to be investigated, and to arrange for the best means of getting at the facts without suppression of the truth or fear of consequences on the part of the men.

The charges, as stated to the Council by Councillor Bloor, were, in addition to a general statement that he did not know of any manufactory in the town where greater ill-feeling existed between a manager and his men than at Saltley, as follows:—(1) That within the last month ten or eleven men had left the works *en bloc* in consequence of the ill-treatment they had received. (2) That within a fortnight the wages of a number of men had been reduced 5s. a week. (3) That men at 30s. a week were compelled to work eighty-four hours in a week. (4) That the effect of the work upon the men was such that men of forty looked to be sixty years of age, and that fifteen years was taken off the life of the men by the severity of the work. On meeting the Committee, Councillor Bloor stated that, in addition to the cases mentioned to the Council, he was prepared to establish that there was a system of (5) general reduction of wages, or such an increase of work without extra payment as amounted to reduction of wages; (6) excessive hours of work in some departments; (7) general tyranny.

It was then arranged that Councillor Bloor should supply a list of the witnesses who would support the charges, that he should procure the attendance of those who were not now in the service of the department, and that the remainder should be summoned by written notice from the Secretary, such notice containing an assurance that nothing which the witnesses might truthfully say should in any way affect their position. The names of seventy witnesses were supplied; and the inquiry commenced at the works on Saturday, March 2, and was continued on March 6, 9, 15, and 20—the whole of these days being occupied in taking evidence. All the members of the Committee attended, including his Worship the Mayor; and Councillors Bloor and Granger were present throughout the inquiry. At the end of the third day, after thirty-nine witnesses had been examined, Councillor Bloor intimated that he did not think that further light could be thrown upon the subject by the examination of others, and did not propose to produce further evidence unless it was desired. But the Committee felt that, as the men's names had been given to them, it was desirable to hear what they wished to say; and they, therefore, proceeded until the list was exhausted. Sixty-four witnesses were examined in all; the number of men employed at the works being 535 in winter and 236 in summer. The evidence related not only to matters which occurred in the present and in recent years, but to some which occurred many years ago. The value of this inquiry must depend upon whether it was exhaustive and fairly conducted; and it is believed that everyone present was satisfied upon these points. No reluctance on the part of the witnesses to speak freely was observed, there was very little conflict of testimony, and the Committee are glad to record their opinion that, taken as a whole, the men who were examined honestly endeavoured to state the facts fairly and truthfully.

It is impossible satisfactorily to set out the evidence of so many witnesses, or even a summary of it, in a report to the Council, but a complete shorthand note was taken, and the transcript may be perused by any member who desires to do so at the office of the Secretary of the Gas Department. In this report the Committee propose to deal with the various charges seriatim, and to state the conclusion they have come to upon each as the result of the inquiry.

1. *The statement that within the last month ten or eleven men had left the works en bloc in consequence of the ill-treatment they had received.*—No evidence in support of this statement was brought forward. It appeared, in the course of the inquiry, that, shortly before Christmas, nine men employed in coke-wheeling struck work over a dispute as to whether a longer or shorter route should be used. The strike lasted, according to one witness, for one hour; according to another, for three hours; and resulted in the discharge of two men, one of whom was subsequently reinstated. No one left voluntarily. The Committee understand that it was a misapprehension of this incident which caused Councillor Bloor to make his statement to the Council.

2. *The statement that within a fortnight the wages of a number of men had been reduced 5s. a week.*—This was proved in the case of two men employed as engine-drivers; but in order to estimate the importance of the occurrence, the whole of the facts should be before the Council. Both these men were examined, and stated that up to May, 1888, they each received 30s. a week. On one pay-day in that month, they each received 35s.; and they both went to the timekeeper and asked him if he had not made a mistake. He told them it was right, and that their wages had been increased by Mr. Hack's orders. In February last the wages were put back to 30s.; and Mr. Hack saw them and told them that there had been a mistake as to the previous increase. It appears that at the beginning of May a conversation took place between Mr. Hack, the Assistant Engineer, and the timekeeper; and the latter understood Mr. Hack to order the increase of wages in question, but it is clear that the written order which is usually, though not invariably, given by the Engineer in such cases, was not given on this occasion. The Committee are quite satisfied that the increase was the result of a mistake through which the men have for some months received much higher wages than are paid for similar services at the other works of the department, and that consequently the reduction, or, more accurately speaking, the correction, was properly made in February.

3. *The statement that men at 30s. a week are compelled to work eighty-four hours in a week.*—It is true that the two engine-drivers before mentioned and others in a similar employment, work on the average eighty-two hours for 30s. a week; but the responsibility for this must rest with the Committee, rather than with the Engineer. In 1886 a return was supplied to the Committee of all men, other than stokers, who worked regularly more than fifty-four hours per week. The Chairman of the Committee and the then Chairman of the Works Sub-Committee (the late Alderman Hart) visited the works; and saw some of the men personally; and subsequently, on the 10th of January, 1887, reported as to the result of their interview, "that the men were satisfied with the hours and rate of pay, and that they preferred that no alteration should be made." During the inquiry, Councillor Bloor stated that at this time he was in consultation with the men, and approved of the course they took; but he has not explained to the Committee how he reconciles this with the complaint he made in the Council. It is but fair to state that the two engine-drivers before mentioned do not now appear to agree with the views expressed by the men in 1886; and the subject calls for further investigation.

4. *The statement as to the effect of the work upon the appearance and duration of the life of the men.*—The inquiry has afforded but little opportunity of forming a judgment upon these points; but nothing has transpired to support the latter part of the proposition. Several of the men who came before the Committee were between sixty and seventy years of age. The Committee ascertained the ages, and observed closely the appearance of the men who came before them, and could not find that they differed from the generality of men as to age coinciding with appearance. The men attribute their rheumatic and other ailments to the exposure to great heat and to sudden and severe draughts, which must be incident to employment in the retort-houses. Before the Council meeting which led to this inquiry, the Committee had proposed certain improvements in the mess-room arrangements, which would furnish better facilities for the drying and changing of clothes after work; and it is by such means as these that some of the risks of the service may, to some extent, be diminished.

5. *General reduction of wages.*—The Committee report that no evidence has been brought forward establishing or suggesting general reductions of wages. Several cases have been brought forward of individual reductions, each depending upon its own particular circumstances. Councillor Bloor includes as reduction of wages those cases in which stoppages have been made from wages for bad or uncompleted work, and those in which fines for disregard of rules or orders have been inflicted and deducted from wages. With regard to these cases, it is obvious that the justice of the stoppage or fine can only be determined by reference to the special circumstances under which it was imposed. Nearly all the witnesses were asked whether such deductions had been made from wages; and very few answered in the affirmative. The total amount deducted for these causes is small. In 1887 the stoppages amounted to £2 0s. 4d.; in 1888, there were none. For the same two years the fines amounted to 18s. 8d. and £1 15s. 3d. respectively. Actual reductions in the wages of individuals have been made on various occasions, as when men have lighter work to do in the summer months, or when men have become less capable, through age or infirmity, to perform the work that they formerly did; but, on the other hand, increases of wages have also been made when the work has increased. It has been ascertained that during the last two years the number of reductions has been sixteen, and the number of increases forty-eight. No case of arbitrary or capricious reduction was brought forward. Almost all the men employed in the retort-houses considered that the work was now heavier for the same money than it was a few years ago, partly in consequence of the use of the regenerative furnaces, and partly from their being expected to put more coal into the retorts. Before the Council meeting on the 19th of February, a deputation of the men saw Mr. Hack upon the latter point; and a plan was adopted for regulating the amount of coal supplied to the men, so that it should be limited to what they then agreed was a proper charge. The complaint of the firemen as to the increased severity of their work from the adoption of regenerative furnaces, does not accord with the other information in the possession of the Committee; and they propose to look further into the subject.

6. *The complaint that the men work excessive hours.*—This subject has in part been dealt with under complaint No. 3. When the return was supplied to the Committee in 1886, it appeared that the number of men at Saltley, other than stokers, who worked regularly more than fifty-five hours a week, was fifteen. The stokers have not complained of their ordinary hours, during which they are not expected to work continuously. Excessive hours are occasionally worked in consequence of some mishap or irregularity, as when machinery breaks down, or when men absent themselves and others have to do their work. The continuous nature of gas-making, and the disastrous consequences to the public if a stoppage should occur, render these cases to some extent inevitable; but every care ought to be taken to lighten the pressure as far as possible. The inquiry has furnished both the Committee and the Engineer with some useful information on this subject.

7. *The complaint of general tyranny.*—The Committee are glad to be able to report that no case of personal tyranny on the part of Mr. Hack has been brought forward. The complaints throughout have affected his subordinate officers rather than himself; but against them nothing has been elicited which justifies a charge of general tyranny. The general effect of the evidence is that subordinate officers have occasionally committed errors of judgment, and in some cases exceeded instructions; and these matters will receive the attention of the Committee. The witnesses who had complaints to make were asked whether they had brought their grievances to Mr. Hack, and the majority of them had not done so—explaining that they feared an appeal to him would in some way be visited upon them by the sub-managers. The Committee were fortunately able to test how far this fear was well founded. Several witnesses were produced who had appealed to Mr. Hack, and generally with success; and in no case did it appear that any harsh treatment on the part of subordinates had ensued. The duration of service has an important bearing upon this question of general harsh treatment, and the following comparison of the two large works of the department may be of interest. The comparison is

made only upon the men permanently employed both in winter and summer:—

—	Number of *Employés.*	Seven years' Service, and upwards.	Two to six Years' Service.
Windsor Street . .	247	118	130
Saltley	236	108	128

It was stated in the Council that the ill-feeling which existed between the Manager and the men was greater than in any other manufactory in the town. If the witnesses called at the inquiry represented the feeling in the works—and they were stated to be representative men—the statement cannot be accepted. A large majority expressed themselves in altogether a different spirit; and many old hands said that they had always been treated well by Mr. Hack. Several men said they had no complaints to make, and did not know why they were sent for. One whose wages had been temporarily reduced by Mr. Hack for an admitted fault said he had no complaint, and added that "he thought there were people who knew his business better than he did himself." The Committee give Councillors Bloor and Granger credit for having brought forward their allegations in the full belief that they would be able to prove them; but it was obvious all through the inquiry that the information with which they had been supplied had been given with insufficient knowledge of the facts, and with a certain amount of high colour which disappeared when subjected to careful examination.

The Committee can only regard the result of this inquiry as an acquittal upon the serious personal charges brought against the Manager at Saltley. The investigation will, however, prove of permanent advantage in several directions. It should certainly convince the men that they may approach the Engineer and the Committee when they feel that a remedy is required for any serious grievance. By bringing the Committee into personal communication with the men, a more complete knowledge has been obtained as to the various processes and methods in the works which involve the greater or lesser amount of labour, and possibly means may be found of effecting improvements.

The Committee trust that the good sense of the men will enable them to put aside any excitement or disturbance which this inquiry may have created; and they see no reason why the work should not be carried on with mutual goodwill between employers and employed in the future.

Mr. Allan Granger (one of the gentlemen who communicated to the City Council the "grievances" of the workmen at the Saltley works) last Thursday addressed the following letter to the local press:—"This morning's post has brought to hand the report of the Gas Committee on the management of the above works. Were this a mere controversy in which a victory of words only was sought, it might be unwise for me to say a single sentence before the discussion which will be raised at the next Council meeting; but the reasonable comfort of the *employés*, the proper conduct of these gas-works, and the financial interests of gas consumers and ratepayers are all involved, and there is no hesitation in indicating points of objection. I heard the evidence of sixty-three of the sixty-four witnesses examined; and the Committee's report reads to me more as the special pleading by counsel for the defendant than as the summing-up and decision by the judge. Even trivial points which tell in favour of the Committee's opinion are brought into prominence, while those of an opposite character are ignored or lightly passed over. Rheumatism is not reckoned worthy of great consideration, and proved grievances are relegated to future consideration. That the work exacted from all the workmen has been in later years excessively increased was demonstrated; and in one department admitted by the report to be so. We are told that a plan has, within the last few weeks, been adopted for the regulation of the weight of coal to be disposed of by the men employed in the retort-houses. The Committee have to be reminded that this plan was asked for two years ago, and its distinct refusal led to a strike, when twenty-eight competent stokers left the works, and their places were supplied by admittedly inferior workmen—all to the financial loss of the Corporation. The statement of fines and deductions is erroneous and misleading. At the time when given in Committee, their completeness was challenged, and the documentary evidence in existence was asked for, but withheld, as were all other documents in the possession of the Committee. Nowhere in the report is a single word to be found as to the contract or sweating system which prevails. The disclosures made as to the make of inferior gas, and the special quality called 'church gas,' and the enormous all-round waste caused by the regenerative furnaces, are passed over in silence, and left outside consideration. In some respects the report of the Gas Committee may be read as a verdict of 'guilty, but don't do it again;' but even taken in this light, it is to be feared that further discussion and inquiry will be necessary. Over two millions of capital are involved."

LEEDS CORPORATION GAS SUPPLY.

Mr. Alderman Spark's Charges of Mismanagement.

Our readers will remember that the Gas Committee of the Leeds Corporation have resolved to invite Mr. Alderman Spark to attend their next meeting, to be held on the 18th inst., for the purpose of justifying, if he can, the statements made by him at the meeting of the Council on the 6th ult. (*ante*, p. 496), to the effect that "mismanagement and trickery" are going on at the gas-works of the Corporation. The subject in connection with which Alderman Spark's charges were specially brought was, it will probably be recollected, the testing of the gas—a matter on which he has on several occasions made some very strong remarks. In the course of a letter addressed to the *Leeds Mercury*, Alderman Spark defends his conduct, and asserts that his object in speaking so pointedly on the occasion referred to was a desire that the Council should appoint a Special Committee to inquire into not only his, but other people's allegations in regard to the management of the gas undertaking. He considers that the delay of six weeks, from the time of making his statement to that named for his justification of it, is sufficient indication that the Committee deem the matter of very little importance. But he regards the whole proceeding as ridiculous, inasmuch as the Committee knew, he says, that he would decline their invitation as being contrary to all precedent. He adds: "The Gas Committee, whenever anyone points out defects in the gas-works, or suggests an improvement, regard that individual as an enemy—to be suppressed at any cost. By members of that Committee I have been assailed whenever I have shown that the illuminating power is below the parliamentary standard. Over and over again I have been charged with personal animosity against the late Engineer, and now against the Committee—with ignorance of gas matters—with quoting false figures; and one member has recently gone so far as to accuse me of showing 'venom.' Yet not once have any of my figures or statements been disproved. And these gentlemen coolly call upon me to appear before them as a culprit? The Committee have insisted upon it that they are the accused. And now, forsooth, they coolly desire to judge their own case! What ought to be done is this. The Council should appoint a Select Committee, composed of (say) four or five members of Council who are not members of the Gas Committee, together with an equal number of members of that Committee, the Mayor to be the Chairman. And, to secure an impartial and a thorough inquiry, evidence should be called on various points—such as the illuminating power of the gas; the quantity of gas made and sold per ton of coal; the coal contracts, deliveries, &c.; and the general management of the works (which would include the charges I have made). Witnesses who are in the employ of the Corporation should be promised immunity from all ill-results on telling freely what they know. There should be a competent shorthand writer employed; and a report, with recommendations, should be presented by the Special Committee to the Council." In a postscript to his letter, he states that more than a year ago (in February, 1888) he offered to place at the disposal of the Gas Committee the information he possessed, which would have been of much service in unravelling and reforming certain irregularities. This offer, he says, was rejected by the Committee with "undisguised contempt." Mr. Ambler, as the mover of the resolution in Committee, has replied to Mr. Alderman Spark's letter. He denies that there was any "summons" in the resolution, but merely an invitation which he innocently supposed Mr. Spark would, as an honest and well-intentioned man, gladly accept, if he believed the statements he had made or the information he possessed to be true, and particularly if he were as anxious as he would have the public believe him to be to remedy the malpractices he alleged to be taking place. The Committee had not the remotest idea imputed to them of wanting him to "justify himself." If his statements were true, he would need no justification; but the Committee were entitled to have the statements justified or withdrawn. As to the suggested Special Committee, Mr. Ambler considers that the idea is only put forward in the hope that, if appointed, Mr. Spark might possibly, in the course of their inquiry (which would deal with the entire management of the undertaking), find something to enable him to justify his statements.

SALFORD CORPORATION GAS SUPPLY.

The Depreciation Fund—The Price of Gas in the Out-Districts.

Last Thursday a deputation of representatives of various Local Authorities situated within the area supplied with gas by the Salford Corporation had an interview at the Town Hall with the Gas Committee, relative to the proposal of the Committee to apply £60,000 from the gas depreciation fund in aid of the borough rates. Mr. R. Spary introduced the deputation, and explained that the object of the visit was to express their objection on behalf of the bodies they represented to the appropriation of £60,000 from the gas depreciation fund, and to ask for an abolition of the differential rate in the outside districts. Mr. George Trenbath then presented a petition, arguing that the proposed transfer was a contravention of the Corporation's Act of 1882. As the result of a similar interview in November, 1887, the price of gas within the borough was reduced from 3s. 1d. to 2s. 10d. per 1000 cubic feet, and outside the borough from 3s. 7d. to 3s. 2d. The differential rate was thus practically reduced from 6d. to 4d. per 1000 cubic feet of gas consumed. The petitioners challenged the right of the Gas Committee to appropriate any part of the £87,000 which had accumulated under the head of "depreciation fund" to the purposes of their borough or district funds, and maintained that, if the Committee had such right, they were bound to exercise it at the end of every year. They further submitted that the abolition of the differential rate would lead to an increase in the consumption of gas. The petitioners suggested that the sum named should remain in the depreciation fund, and that to this fund, until it was exhausted, should be charged year by year the cost of repair and maintenance of the gas-works; the annual transfer to depreciation fund of 3 per cent. on capital account meanwhile to cease. Other delegates having addressed the Committee, Mr. H. Lord, on behalf of the latter, pointed out that the Town Council, at their next meeting, would be recommended to reduce the price of gas 4d. per 1000 cubic feet all round; making the charge 2s. 10d. to consumers outside the borough, and 2s. 6d. to those within the borough, or 2d. in price less in Salford than in Manchester. He promised that the arguments submitted by the deputation should receive the careful consideration of the Committee.

CHORLEY CORPORATION GAS SUPPLY.

Proposed Extension of the Works—Reduction in the Price of Gas.

At the Meeting of the Chorley Town Council last Thursday, a long discussion resulted upon the presentation of the minutes of the Gas Committee, which embraced the following items:—Ten tenders for the supply of gas-retorts and fire clay were opened, and it was resolved that the offer of Messrs. Orlando Brothers and Co., of Blackburn, be accepted. A letter was read from Mr. Thos. Newbigging, C.E., containing his terms for the preparation of the requisite drawings for carrying out the extensions to the gas-works on which he had reported. The terms of Messrs. R. Dempster and Sons, Limited, of Elland, for the same purpose were also submitted; and it was resolved that the latter be accepted. It was further resolved that the recommendation of the Special Gas Committee, adopted on the 7th inst., with respect to carrying out Mr. Newbigging's report, be postponed to a future meeting of the Committee, together with the question now raised by the Town Clerk as to obtaining the necessary funds (£5000) to carry out the works comprised in such report. The Committee recommended that the reduction in the price of gas ordered at the last Council meeting be effected by increasing the rate of discount from 3d. to 6d. per 1000 cubic feet. The subject of the proposed extension did not provoke any discussion; but on the question of the reduction in the price of the gas, there was evidently a difference of opinion about the method. Mr. Critchley moved an amendment to the minute putting the reduction in the price upon the discount, on the ground that it would not benefit many cottagers and tradesmen who could not pay within the prescribed time. To them, he held, it would be a hardship. Suppose a poor tradesman burned 10,000 cubic feet of gas per quarter, what would the Corporation lose in interest if the account was not paid punctually. They would lose ¼d. per week, or 1d. a month. But the poor consumer who had neglected, or had been unable to pay, would lose 5s. It was argued that by allowing larger discounts they were in a position to get their money in easier; but he understood there were never less arrears than at the present time, so that there was no need for the extra discount. He would not object to the allowance of 5 per cent. all round. Mr. Darwen seconded the amendment. Alderman Bamber, in supporting it, said it was not right to charge 3s. 9d. per 1000 feet for gas when they could afford to sell it at 3s. 6d. After a prolonged discussion, the matter was put to the vote, and the amendment was lost by 8 to 13. The minutes were then confirmed.

At last Wednesday's meeting of the Southampton Town Council, it was agreed to improve the public lighting by increasing the consumption of gas in some of the principal streets, at an estimated additional outlay of £121 per annum.

THE LONDON COUNTY COUNCIL AND ELECTRIC LIGHTING.

At the Meeting of the London County Council on Tuesday, the General Purposes Committee reported that they had had before them the following important letter, addressed by Mr. Henry G. Calcraft, of the Board of Trade, to the Chairman of the Council (Lord Rosebery):—

I am desired by the President of the Board of Trade to inform your Lordship that the question of electric lighting in the Metropolis is at present receiving the serious consideration of this Department. Thirteen applications for Provisional Orders under the provisions of the Electric Lighting Acts, 1882 and 1888, in respect of areas within the Metropolis are now before the Board. In dealing with these applications, the Board of Trade are at once confronted with two important questions of principle—(1) What should be the extent and nature of the area to be granted? (2) Should or should not concurrent powers be granted to two or more companies within the same area? As regards the former, many considerations must be taken into account—*e.g.*, What is the financial position of the undertakers applying for statutory powers in any given area; how far any one company would be in a position satisfactorily to supply such an area; and in connection with this, much would depend on what distance electrical energy for electric lighting purposes can be safely and conveniently furnished from a central station. As regards the latter question, on the one hand it appears to the Board of Trade to be highly desirable to avoid the grave inconvenience to which the public were subjected when there were competing gas companies supplying the same areas in the Metropolis; and further in the case of electric lighting, uncertainty exists whether mains can be satisfactorily laid in close proximity to each other. On the other hand, some of the Local Authorities in the Metropolis appear to be desirous to encourage competition, and are anxious to avoid the creation of a monopoly or *quasi*-monopoly for electric lighting by giving any company exclusive powers for any one area.

Before deciding on the action to be taken on the applications at present before the Board of Trade, they propose to adopt their usual procedure, and to hold a local inquiry, of which full notice will be given, and at which all those interested can be heard; but they are anxious to take no definite step which may have important bearing on the future policy to be pursued with regard to electric lighting in the Metropolis without communicating in the fullest manner with the County Council of London. In this determination they are greatly influenced by the consideration that before long the jurisdiction which the Board of Trade now exercise in regard to electric lighting matters in the Metropolis may be transferred to the County Council; and they would therefore be most unwilling to take any action which might hamper that body in dealing with the question in the future.

With this view they propose, as soon as the report of the inquiry has been received, to forward it to your Lordship for the information of the County Council; and I am at the same time to express a hope that this Board may then be favoured with any observations which the County Council might wish to offer upon this large and very important question.

ELECTRICITY *V.* GAS AT CHELMSFORD.

The Lighting Committee of the Chelmsford Town Council, at a meeting held on Feb. 25, having considered tenders for lighting by oil, gas, and electricity, reported in favour of the last-named; recommending "the Council to enter into a contract, for lighting the borough for five years, with Messrs. Crompton and Co., Limited, upon the terms of their amended tender, dated Feb. 13, provided that the term for which they retain the right of private lighting be reduced to five years from the expiration of the contract, and subject to the details of the contract being approved by the Lighting Committee." Messrs. Crompton's original tender was for 20 arc lamps and 65 incandescent or oil lamps, at a cost of £700 per annum. The tender was afterwards amended, and the number of incandescent lamps increased to 110 (oil-lamps being abandoned), the price remaining the same. The tender of the Gas Company was £3 14s. per lamp per annum, as against £4 5s. 6d. for last year—showing a reduction of about £100. The Council have had the report before them on two occasions; and, at a special meeting held three weeks ago, it was decided to call a public meeting, and invite the opinion of the burgesses upon the matter. This meeting took place in the Corn Exchange last Tuesday evening; and the large attendance showed that very great interest is felt in the subject. The Mayor (Mr. F. Chancellor) presided. Mr. Whitmore moved—"That this meeting is of opinion that the recommendation of the Lighting Committee be carried out—viz., that the Council be requested to accept the tender of Messrs. Crompton and Co., for the public lighting of the borough." He stated that the arc lamps it was proposed to employ would be of 1200 candle-power, and the incandescent lamps of 32-candle power, as against gas-lamps of about 12½ to 15 candle power. He believed the adoption of the scheme would improve the trade of the town; and he was satisfied it would enhance the appearance of the borough. Mr. Darby seconded the resolution. Replying to Mr. Alderman Duffield (the Chairman of the Gas Company), Mr. Whitmore said incandescent lights would be used in those parts of the town not lighted by arc lamps; and wherever a gas-lamp stood in those parts, there would be placed an incandescent lamp. No oil-lamps would be used. This would be done without any increase in cost to the borough. Other questions having been put by various gentlemen, Mr. Cutts moved an amendment in favour of lighting the main streets with arc lamps and the other parts of the town with gas. This was not seconded; and, as the Chairman remarked, it "fell to the ground." Mr. Bennell asked if an amended tender had not been sent in by the Gas Company. The Chairman said there had been no tender from the Gas Company before the Council other than the one under discussion. He knew an amended tender had been sent in by the Company; but as it was opened in Committee he did not feel authorized to speak further upon it. Alderman Duffield remarked that the Gas Company had sent in an amended tender, offering to light all the present lamps for the sum of £604, which was something like £100 below the tender of Messrs. Crompton and Co. He was not, however, going to put the question purely as one of expense; the question was which was the best light, and which could they rely upon most, in the present state of matters. He asserted that the electric light for public purposes had been proved to be almost an entire failure. Alderman Brown characterized the sending in of an amended tender by the Gas Company as "uncommercial and unfair." Alderman Duffield said this amended tender was only sent in after an amended tender of Messrs. Crompton, by which the latter firm increased the number of their lamps by 45, had been received; and he contended that the Company should be allowed to do what Messrs. Crompton had done. Alderman Brown, the Chairman of the Lighting Committee, having replied to the remarks of Mr. Cutts and Mr. Duffield, the proposition was put and carried by a large majority.

At the meeting of the Town Council last Wednesday, the question of lighting the borough by electricity was freely debated; and it was finally resolved to adopt the tender of Messrs. Crompton and Co.

At the meeting of the Chelmsford Town Council on the following evening, the report of the Lighting Committee, recommending that Messrs. Crompton and Co.'s tender be accepted, was brought forward. Alderman Brown stated that, as Chairman of the Lighting Committee, he had that morning received a letter from Messrs. Crompton, stating that they were prepared to light the whole district (outside the area of the arc lamps) with incandescent lights, and to do away with the oil-lamps altogether, without affecting the cost. The Town Clerk read a letter from the Secretary of the Gas Company, enclosing an amended tender offering to light the town at a cost of £3 4s. per lamp per annum. Mr. Fawkes proposed that the letter be not entertained. Mr. Morton said it would hardly be correct for them to receive the amended tender now. If this amount had been stated in the first instance, he believed it would have met with great consideration, and possibly have been accepted. Alderman Gray asked how much the arc lamps were estimated to cost, and how much the incandescent lamps. Mr. Taylor said at the meeting of the Lighting Committee it was understood that the arc lamps were estimated at £22 10s. each. Alderman Gray said this would allow £2 5s. 6d. for each incandescent light. After some further remarks, the Committee's recommendation was adopted without a dissentient—those members of the Council who are Directors of the Gas Company refraining from voting either way. Alderman Duffield remarked that Mr. Morton had stated that he did not think it would be fair to allow the Gas Company to send in an amended tender. This matter was fully considered by the Directors, and they considered, after what had taken place with regard to Messrs. Crompton and Co.'s tender, that they were justified in sending in an amended tender. They found that a member of the firm was present at the meeting of the Lighting Committee, that he knew what the tender of the Gas Company was, and that he had an opportunity of hearing every discussion that took place. They had therefore done nothing dishonourable in sending in an amended tender; nor was there anything unbusinesslike in their action, as was loudly suggested at the public meeting on the previous day. Mr. Morton said he did not reflect upon the Gas Company, but he thought it would have been improper for the Council to accept the amended tender. Alderman Brown said Messrs. Crompton's tender had only been amended in detail, as had also the original tender of the Gas Company; but the further amended tender of the Company, read that evening, had also been amended in price. The matter then dropped, and the whole question of the lighting was referred to the Lighting Committee, with instructions to report more fully as to the positions of the various lamps, with details as to the work, to the next meeting of the Town Council.

As a great deal was said at the meetings above reported as to the alterations of the tenders sent in by the competing parties, it may be well to state again that Messrs. Crompton and Co.'s original tender was for 20 arc lamps, for £500, and 65 incandescent or oil lamps, for £200—total, £700. The oil-lamps, to the number of 38, were to be employed in the outskirts of the borough. It appears that some objection was raised to this, on the ground that three kinds of lighting—arc and incandescent electric lamps and oil—would be employed in the borough. The tender was accordingly altered to exclude oil lighting altogether. Subsequently the firm submitted an amended tender, in which the number of incandescent lamps was increased to 110, or by something like 80 per cent. The Gas Company's tender was for £3 14s. per lamp—220 lamps being stated, in accordance with a schedule. The number was afterwards altered to 192 (the Company's specification); but still the price was at per lamp burning 4½ cubic feet for 4000 hours. Finally, the Company took off 10s. per lamp; and for this they were charged with acting in a manner that was "uncommercial and unfair," notwithstanding that their competitors had been allowed to make a substantial increase in the number of lights to be furnished, without a corresponding advance in price, which was, of course, tantamount to a reduction. The partizans of electric lighting triumphed; but how the contractors and the ratepayers will like their bargain at the end of the five years for which it has been made, remains to be seen.

MORLEY GAS COMPANY'S BILL.—This Bill came before the Chairman of Ways and Means Committee of the House of Commons last Friday as an unopposed measure. Mr. T. Newbigging, C.E., gave evidence stating that the Company's area of supply was not increased; but the population having quadrupled since the Company's last Act, it would be necessary to expend £22,000 in the course of the next two years. The promoters sought power to acquire £40,000 additional share capital; the dividend being limited to 7 per cent. on the ordinary, and 6 per cent. on the preference capital, subject to certain clauses, to repeal certain sections of the Acts of 1847 and 1848, and to enable the Company to apply for a Licence to supply electricity. Since the Bill was introduced, the Company, at the instance of the Morley Corporation, have agreed to insert clauses raising the illuminating power of the gas from 14 to 16 candles, and reducing the maximum price from 5s. to 4s. per 1000 cubic feet. The Bill as thus amended was passed, and ordered to be reported to the House.

THE NEW HOLDER AT THE CLITHEROE GAS-WORKS.—Practically the work of constructing the new holder at the Clitheroe Corporation Gas-Works is completed; and in the course of a week or two the vessel will be ready for filling with gas. The tank was made by Messrs. T. Small and Sons, of Birmingham; the amount of the contract being £1260. The cost of the holder itself is £1714. The latter has been erected by Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees. The diameter of the tank is 82 feet; the inner lift of the holder, 78 feet; and the outer lift, 80 feet. Each lift is 20 feet deep; making a total depth of 40 feet. The height of the columns is about 40 feet. The capacity of the holder is about 200,000 cubic feet. Strength has been combined in the structure with a light and airy appearance; the design being of a very pretty character. The holder is of the latest type of gasholder construction, and the whole of the external material is wrought iron. Mr. T. Newbigging, C.E., of Manchester, is Engineer for the work, which has been carried out under his supervision.

THE STRIKE AT THE HALIFAX GAS-WORKS.—The Gas Committee of the Halifax Corporation, with the desire to ensure, as far as possible, the safety of the new men employed at the gas-works, and in the determination to put a stop to such attacks as those which are recorded in our "Legal Intelligence" to-day, have obtained from Bradford the services of 50 additional policemen, who are now on duty in plain clothes in various parts of the town. A meeting of the men on strike was held on Monday last week, when a resolution was adopted in favour of asking permission to return to work on the conditions stipulated for by the Gas Committee. A petition was afterwards promoted, signed by a large number of the men who are willing to resume work, and presented to the Gas Committee. This, of course, indicates a complete collapse of the strike. The unfortunate part is that the decision is a little late in the day; there being now but few vacancies at the works. There has lately been considerable improvement in the quality of the gas; and, apart from the emergencies of the case, no extra expense has been incurred in procuring this result. The Manager and the new men are said to have gradually brought the works under entire control.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

The Aberdeen Corporation Gas Committee met on Wednesday to consider the estimates which had been sent in for a new and enlarged set of purifiers at the gas-works. The lowest offer—£380—by Messrs. Henry Balfour and Co., of Durie Foundry, Leven, was accepted. The highest offer was £519. Mr. A. Smith, the Gas Manager, submitted an application for additional regenerative furnace plant, by which, he said, he expected to be able to save £1500 a year. While looking kindly on the Manager's proposal, the Committee asked Mr. Smith to prepare for them an estimate of the cost involved, as well as the saving to be effected.

A meeting of the St. Andrews Gas Company, convened by five Directors, was held last Wednesday. The Gas Manager (Mr. J. Hall) read the requisition calling the meeting, which stated that the particular business was to consider the following motion:—"That the partners of the Company resolve to call upon, and hereby call upon, Mr. John Paterson, Kinburn House, to resign his office of Director of the Company, as his actings have been, and are at variance with the interests of the Company; and he has thereby forfeited their confidence." In reply to the circular, Mr. Paterson had forwarded him a lengthy document, in which he gave notice of an amendment to the above motion, requesting the five Directors who had requisitioned the meeting and the Manager to resign, as their actings were at variance with the interests of the Company. (Laughter.) Mr. Paterson further wrote that the circular calling the meeting constituted a false and malicious libel, and rendered all taking part in it liable to an action-at-law. The Chairman, in moving the above resolution, stated that in the original contract of copartnery there was a special provision that "all the partners shall use and employ their utmost endeavour to promote and advance the interests of the Company." He maintained that Mr. Paterson had infringed that provision by the method by which he had endeavoured in November last to get the gas-works transferred to the town. The motion was subsequently carried unanimously. This matter was dealt with at length in my "Notes" in the JOURNAL for March 12.

Mr. J. Watson, the Engineer to the Dundee Water Commissioners, reported to the Works Committee on Thursday, that the new line of mains from Lintrathen Loch to Pitnappie, was, on March 18, subjected to the full hydrostatic pressure of 545 feet in the valley of the Isla; the test lasting from noon till 10 p.m. Mr. Watson's report proceeded: "I need not point out that the test was a very severe one; and, while I am averse to compare the behaviour of the old main with that of the main just completed, it is right to say, as is well known, that the old main was never subjected to such a test so far as duration is concerned, and that before the pressure could be got up to 545 feet, a record of not less than 25 bursts and many leaks rendered it prudent and probably necessary not to prolong the strain due to such a pressure more than three hours. . . . . The maximum quantity of water carried by the main while under the full available pressure was equal to 9,900,000 gallons per day. It is necessary to point out that the delivering power of this main will, with age, be gradually reduced, as Lintrathen water quickly corrodes even coated pipes. The old main is considerably reduced in diameter by oxidation, and the flow in consequence is largely diminished, and also retarded through increased friction; so that, while this large volume of water could meantime be passed on to the Pitnappie reservoir by the new main, the encrusted state of the old main between Pitnappie and Clatto will not admit of passing more than from 7,500,000 to 8,000,000 gallons per day along this section of the work. In all the tests to which the new main has been subjected, no accident of any kind has yet happened, and no one of the thousand joints made has required to be touched a second time. I venture to say that, considering the difficult and trying nature of the work and tests, the record up to this time of the behaviour of the new main is both satisfactory and exceptional." The Committee expressed their gratification at the satisfactory completion of the work. The Contractors—Messrs. D. Y. Stewart and Co., of Glasgow—have been fully paid; the sum received by them amounting to £33,332.

An inquiry was held by Sheriff Melville at Linlithgow on Monday last, by order of the Secretary of State for Scotland, into the condition of the water supply of the burgh. The evidence led showed that the water supply of Linlithgow had grown with the town, which is a very ancient one; but it also revealed how very much behind modern requirements the quaint old town is. The scheme which it is intended to carry out was explained by Mr. John A. Warren, C.E., of Glasgow, by whom it has been prepared. He recommends that a reservoir, with a capacity of 12 million gallons, be constructed in Preston Glen, to intercept the Preston Burn, which drains an area of 230 acres. He calculates that the daily consumption of water will be 150,000 gallons, of which he proposes to take 120,000 from the Preston Reservoir; and the remainder by a separate pipe from the Butter Well. The cost, exclusive of the acquisition of land and law expenses, he estimates at £5000. Manufacturers and others object to the scheme on account of the absence of provisions for compensation water. After evidence had been led on both sides, the inquiry was adjourned for a fortnight, during which time an attempt is to be made to come to terms upon the question of compensation water.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

The income from sales of gas in Glasgow and the suburbs is still on the increase. Towards the end of the past month, the Treasurer to the Gas Trust had received upwards of £215,000 for the ten months, commencing the 1st of June, 1888, as compared with fully £209,000 for the same period in the last financial year. There was thus an increase of upwards of £6000, notwithstanding the reduction in the price of gas of 2d. per 1000 cubic feet in the early part of the present financial year. Early in the month now drawing to a close, the receipts from the sale of residual products amounted to £46,744 for the current financial year, as against £34,404 for the corresponding portion of the year 1887-88. These returns show an increase of £12,340 in favour of the present year, which is a very material item.

Mr. W. Foulis, the General Manager to the Glasgow Corporation Gas Commissioners, has been authorized to order from Messrs. R. Laidlaw and Sons a new exhauster for the Tradeston works, provided that they agree to furnish it at the same price as the last one which they supplied to the Gas Trust.

Most of the meter inspectors in the employ of the Glasgow Gas Trust are at the present time busily engaged "taking stock" of the extensions being made in their respective districts in house property, &c., with a view to the re-arrangement of the same for the next financial year beginning on the 1st of June. In the city and suburbs there are sixty such districts, in each of which there is an Inspector or Surveyor. There used to be about 130,000 meters to survey or "read" three times a year; but the number is not now so great, as many industrial establishments, warehouses, &c., which had two, three, or more meters, have now gone in for one large meter—the others being dispensed with. Besides the meter inspectors, there are twenty collectors of accounts, each of whom has three inspection districts under his charge. Though there are so many outside collectors of accounts, by far the major portion of the gas-rental is paid over the counter at the Gas Office in Virginia Street.

I understand it is highly probable that the contract for adding a third lift to one of the large holders at the Dawsholm Gas-Works will be placed with Messrs. Clayton, Sons, and Co., Limited, of Leeds. As previously mentioned, this additional lift will increase the capacity of the holder not less than half a million cubic feet.

At the old-fashioned Clyde watering-place known as Largs—a town on the Ayrshire coast—a Gas Company has been in existence since the year 1839; and lately the Directors of the Company, together with a number of the shareholders and consumers, celebrated the jubilee of the undertaking by a supper, the same celebration also having reference to the Company being transformed into a limited liability concern. Mr. Alex. Young, one of the Directors, presided. Full justice having been done to an excellent supper, and the loyal and patriotic toasts having been duly honoured, Captain Fraser proposed the toast of the evening, "The Largs Gaslight Company, Limited." In the course of his remarks, he stated that he had in his possession a requisition to the Gas Company to light the streets of the village, to which his late father's name was adhibited; and his father-in-law had been Chairman of the Company for many years. The Company had done much for Largs, and they had also done something for themselves. The Company had come there that night to give a valedictory address to the public. It had been found inconvenient for the burgh to take over the works; and so they had resolved themselves into a limited liability concern. The Burgh Commissioners had not been consulted on the matter, but he thought the change would be for the benefit of the ratepayers. He hoped they would now get gas at the same rate as was charged in Glasgow and other places, and with the same lighting and heating power. Since the Company had become a limited liability concern, the gas had been much better than it was previously. The Chairman, in replying in the name of the Company, explained the reason why the meeting was held—namely, to commemorate the successful expansion which the Company had experienced during the past fifty years. Good gas was of the greatest importance to a community; and few burghs in Scotland could boast of better gas than that which was provided in their own town. After briefly sketching the early history of gas lighting, the Chairman proceeded to say that, looking over the books of about thirty years ago, he noticed the Company were highly indebted to the late Mr. Hugh Kerr, of Elmbank — a gentleman who took the position of Chairman of the Company, and manifested the deepest possible interest in its affairs. The Directors in succession ever since had been able to issue very satisfactory reports to the shareholders, and to declare good, steady dividends, which, he thought, ought to elicit the shareholders' feelings of grateful satisfaction. A sum of about £2500 was expended on a new gasholder, extensions, and renewal of works a few years ago. It afforded the Directors much pleasure to announce that the debt of the Company had been gradually reduced to the sum of £350; and the capital stock of the Company had been recently increased from £15 to £20 per share. One of the other toasts was "The Health of Mr. John Cowper," who was not only the oldest shareholder present, but who is the only one of the original shareholders left, and has been upwards of thirty years a Director of the Company. Various other toasts followed, including "The Company's Officials," to which reply was made by Mr. Marshall, who was appointed Manager about three years ago.

No time is being lost in getting to work to carry out the new water-supply scheme for the burgh of Falkirk and the parish of Larbert. Last Wednesday, in the presence of Provost Hodge, of Falkirk, and most of the Water Trustees, the ceremony of casting the first pipes for the conduit was performed by Messrs. D. Y. Stewart and Co., Glasgow. A number of the pipes were likewise tested to the required standard of 600 lbs. to the square inch. The Trustees, having been conducted through the various other departments of the foundry, were thereafter entertained to luncheon by the Contractors in a large room adjoining the offices. On Tuesday of the ensuing week, the ceremony of cutting the first sod for the same works will take place at Faughlin Burn. On this interesting occasion, the Contractors, Messrs. D. Y. Stewart and Co., will present Provost Hodge with a silver spade bearing a suitable inscription.

The Glasgow pig-iron warrant market has been steady during the past week; and the price of Scotch warrant iron advanced from 44s. 2½d. per ton, cash paid, on Monday, to 44s. 10d. per ton yesterday morning—the close in the afternoon being a shade easier. There is a fair demand for Scotch special brands; and prices are a little firmer. At present not much speculation in warrants is taking place, but the general trade is good; and it is probable that the shipments will shortly exhibit a material increase.

More firmness is showing itself in the local coal trade; but prices are practically unchanged.

THE QUALITY OF THE GAINSBOROUGH WATER SUPPLY.—Since the introduction of the new artesian well water into Gainsborough, much discussion has taken place, officially and otherwise, as to its suitability for domestic and manufacturing purposes, owing to its extraordinary hardness. A short time since it was announced that some of the boilers in a local works had been seriously damaged by the action of the water; and the Board of Health resolved to have further tests made, and notice the effect of the water on their own boiler. The incrustation in that boiler, it is stated, is sufficient proof that the water is dangerous for drinking purposes.

GASEOUS FUEL AND THE ABATEMENT OF NOXIOUS VAPOURS.—Last Friday, Mr. B. H. Thwaite delivered an interesting lecture in Manchester, under the auspices of the Manchester and Salford Noxious Vapours Abatement Association, on "Gaseous Fuel." Mr. Herbert Fletcher, of Bolton, presided, and explained that the meeting had been convened for the purpose of enlisting public sympathy with this movement, and thereby to strengthen the hands of Lord Coleridge upon the introduction of his Bill dealing with the matter. Mr. Thwaite described at the outset the development in the production of gas for lighting and heating purposes, from its inception by Murdoch to the present day, and then dwelt upon the various methods adopted until the system of producing gas by the decomposition of water was reached. He then showed that the discovery of natural gas in Pennsylvania had raised the industries of that neighbourhood to a position of great prosperity, and, as exemplified by the extraordinary alteration in the atmosphere of those industrial centres, that gaseous fuel was the one remedy to remove the intolerable and insanitary evils arising from smoke. The lecturer suggested a system of distributing cheap gas by the establishment on the different coal-fields in England of gas-producing plant, and transmitting the gas through steel tubes to various industrial centres. By this means the cost of transit by railway, the profits of middle-men, merchants, and waggoners would, he said, be saved; and he concluded that the economy in the Metropolis alone by this system would justify an expenditure on plant and pipe lines of 50 millions sterling, at the lowest possible computation.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 30.

Sulphate of Ammonia.—The week closes very quietly; and although £12 to £12 2s 6d was readily obtainable during the earlier part, the lower figure is barely obtainable to-day. A great deal has been said about the vagaries of the nitrate market at Hamburg; but those who profess to devoutly believe in the direct influence of nitrate prices upon the sulphate market will have been astonished to find that just at the time when nitrate was at its lowest in Hamburg, sulphate was at the highest point of the month on this side. The facts remain that sulphate is scarce at all the country ports; that consumers have no stocks; that the dealers will have to complete their engagements; and that the season being late there will probably be a large demand in April, which may be further increased if sulphate is largely drawn upon for the increased sowings of beet, encouraged by the high sugar prices. Speculators may quote £11 15s. for April delivery; but do they expect makers blindly to do their bidding? There is nothing to prevent a steady market in both nitrate and sulphate during April, if lower prices are not encouraged by the holders.

LONDON, *March* 30.

Tar Products.—The chief feature in this market is the great demand for creosote and other tar oils, which has not only overtaken the winter's production, but leaves distillers with no stocks for the summer's requirements. Benzoles are better—3s. having been paid for nineties; but fifties languish at 2s. 1½d. Anthracene is also slightly better; but buyers are somewhat indifferent. Higher prices are being paid for tar. Prices: Tar, 20s. to 25s. per ton. Benzol, 90 per cent., 3s. per gallon; 50/90 per cent., 2s. 1½d. per gallon. Toluol, 1s. 5d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha (30 per cent.), 1s. per gallon. Light oil, 3d. per gallon. Creosote, 2¼d. per gallon. Pitch, 20s. to 23s. per ton, according to position. Carbolic acid (crude), 3s. 9d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 17s. per ton. Anthracene (30 per cent.), "A" quality, 1s. 4d. per unit; "B," 1s. 1d. to 1s. 2d. per unit, according to quality.

Ammonia Products.—The sulphate market has been sluggish; but it has picked up a little at the end of the week. The lower price of nitrate is reflected in this market. Varying prices are reported as having been taken during the week; but to-day's value may be said to be £11 15s. to £12 per ton. Prices of other products are: Gas liquor (5° Twaddel), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, from 3d. to 4d. per lb. Muriate of ammonia, brown, £19 per ton; white, £25 per ton. Sal-ammoniac, £30 to £33 per ton.

PROPOSED EXTENSION OF THE DARWEN CORPORATION WATER-WORKS.—The Darwen Corporation are negotiating for the purchase of the old Blackburn water reservoirs at Pickup Bank and Daisy Green; but the sum asked is considered to be too high, and a bargain has not yet been struck. Darwen is not very well supplied with water, and an extension is necessary with the increase of the population.

THE OIL LIGHTING AT ERITH.—Our local correspondent writes: "Messrs. Defries, the contractors for the oil lighting of Erith and Belvedere, in addition to being fined for the non-lighting of any of the public lamps, are now being menaced with another grave responsibility; the Erith Local Board having notified that if any accident should occur in consequence of the lamps not being alight, the contractors will be held liable for any compensation which may have to be paid as the result."

UCKFIELD WATER COMPANY.—This Company, having obtained a Special Act for incorporation in the session of 1888, has now been successfully floated, and a contract has been entered into for the building of the pumping-station and reservoir and laying the mains. The work will shortly be commenced. Meantime the well is being completed in connection with the artesian boring, which has reached a depth of 278 feet, and from which an excellent supply of very pure soft water has been obtained.

BRISTOL WATER COMPANY.—The annual meeting of this Company was held last Saturday week. The Chairman (Mr. E. Bush), in moving the adoption of the report and accounts (which were noticed in the JOURNAL for the 19th ult., p. 541) said there was an increase of £1200 on the revenue for the year. In regard to their new debenture stock, the average price realized for considerably more than one-half was £105 16s. 9d.; and the Directors proposed to issue the remainder at a sum not lower than £105 15s. This debenture stock was to pay off the temporary loans already borrowed; so that it would not interfere with their new works now being constructed—for these the Directors would call up on the 5 per cent. shares. He was glad to know that the statement at the last meeting, that the Board did not anticipate serious opposition to their Bill, had been fulfilled. Mr. Jones seconded the resolution, which was carried unanimously. A dividend of 4½ per cent. for the six months was declared; making the dividend for the year 8½ per cent.

NORTHERN COAL TRADE.—There has been an increased demand for steam coal during the past few days; and the opening of navigation has given a slight impetus to both this and the gas coal branch of the trade. Steam coals have been in fair demand; and the price for best Northumbrian qualities has again risen to 10s. per ton f.o.b. Small steam coal commands about 8s. per ton. Although the requirements of the gas companies locally are much less than they were, the beginning of the export season is making a counterbalance; and the output is now likely to be well maintained, for in a month or two the shipments to Cronstadt will begin. It is believed that the contract for the gas coal for Moscow has been given out; but the prices have not yet transpired. One or two sales of odd cargoes of gas coal have been made on the basis of 8s., less 2½ per cent., f.o.b. in the Tyne. The time for the renewal of the sliding scale in the Durham coal trade is near. Some of the miners have resolved to demand an increase of 20 per cent. in wages.

WEST GLOUCESTERSHIRE WATER COMPANY.—The annual meeting of this Company was held at Bristol last Saturday. The Chairman (Mr. Brogden) announced that the past year's working showed a fair profit. Since the previous year nearly 300 additional services had been laid; making the number of houses now supplied 1000. The Company's mains passed only 2600 houses out of the 12,000 within their limits of supply. The Directors, however, were daily receiving applications to make extensions; and it was absolutely necessary that the capital requisite for the completion of the system of distributing-pipes should be provided. The Board had every confidence that such additional outlay would realize sufficient revenue to pay a handsome dividend. Dr. Blaxall, of the Local Government Board, had, he said, reported that the inhabitants in the Company's district were happily becoming discontented with their contaminated well system, and were anxious to obtain a supply of water from the Company. The report was adopted. The Engineer (Mr. Martin) said, that all that was needed to ensure the Company's success was the immediate extension of the distribution-pipes.

THE NEW WATER-WORKS OF THE STAFFORD CORPORATION.—At the meeting of the Stafford Town Council last Thursday, a letter was read from the Local Government Board formally sanctioning the borrowing of £13,000 for water-supply works, and intimating that permission to borrow the remaining sums required would be granted shortly. The Water Committee recommended the acceptance of tenders amounting in the aggregate to £14,883, for laying rising and distributing mains and appendages, constructing and completing the covered service reservoir, erecting and finishing buildings at the pumping-station, constructing a new well, and providing pumping machinery. The Committee recommended that application should be made to the Local Government Board for borrowing powers for £5000 beyond the £20,000 already applied for. The report was agreed to; and the application was ordered to be made.

PROPOSED ADDITIONAL WATER SUPPLY FOR SHREWSBURY.—Yesterday week a special meeting of the Shrewsbury Town Council was held to receive a report from the Gas, Water, and Lighting Committee relative to the water supply of the town. The Committee reported that they had passed the following resolution:—"Being of opinion that the present water-works are not commensurate with the requirements of a constant supply of water to the borough night and day, and looking to the fact that a great difference of opinion exists as to the best mode of obtaining a better supply, the Committee proposes to apply to the Council for leave to retain the services of an experienced engineer to report on the relative merits and the probable cost of the four following methods for obtaining the object in view:—(1) Improvement of the present works; (2) another river water scheme; (3) a gravitation scheme; and (4) a well scheme. The Committee therefore recommend the Council to sanction the retaining of some independent and eminent expert in such matters, with the view of his furnishing a preliminary report both as to the estimated cost, the quality, and sufficiency of supply for the guidance of the Committee in the future." The Mayor (Alderman G. B. Lloyd) said the matter was one of very great importance; and it was certainly the duty of the Council to find a good and constant supply of water for the town. They recently had another scheme before them—the Skelton scheme—which had been set on one side; and they had now to consider the question *de novo*. Sir R. D. Green Price, the Chairman of the Water Committee, moved the adoption of the report. All were agreed, he said, that the supply of water for the town was not what it should be. They wanted a report from a thoroughly independent expert who had had nothing to do with any previous scheme, and who would give them an unbiassed report. Alderman Crump seconded the motion; and, after a prolonged discussion, it was carried.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p 612.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	19—20	..	5 5 0
100,000	10	,,	7½	Do. 7 p. c.	10	13—14	..	5 7 2
800,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	100	110—112	..	4 9 3
100,000	20	29 Nov.	10	Bahia, Limited	20	24—26	..	7 13 10
200,000	5	14 Nov.	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	5¼—5¾	..	5 4 2
380,000	Stck.	14 Feb.	11½	Brentford Consolidated	100	234—239	..	5 2 7
125,000	,,	,,	8½	Do. New	100	164—169	..	5 3 7
220,000	20	14 Mar.	10½	Brighton & Hove, Original	20	42—44	..	4 15 5
330,000	20	28 Mar.	11½	British	20	45—47*	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
39,000	10	,,	8	Do. 7 p. c.	10	13—14	..	5 14 3
828,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	14—15	..	5 6 8
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	28 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	12 Oct.	13⅔	Commercial, Old Stock	100	268—273	..	5 0 8
180,000	,,	,,	10⅔	Do. New do.	100	x115—230	..	4 17 9
130,000	,,	28 Dec.	4½	Do. 4½ p. c. Deb. do.	100	126—128	..	3 10 3
557,320	20	13 Dec.	13	Continental Union, Limited	20	47—49	..	5 6 2
242,680	20	,,	13	Do. New '69 & '72	14	32—33	−½	5 10 3
200,000	20	,,	10	Do. 7 p. c. Pref.	20	38—40	..	5 0 0
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	204-208*	+1	4 16 2
234,060	10	30 Jan.	13	European, Limited	10	25½—26½	..	4 18 1
120,000	10	,,	13	Do. New.	7½	17—18	−1	5 8 7
354,060	10	,,	13	Do. do.	5	12—13	..	5 0 0
5,468,600	Stck.	14 Feb.	13	Gaslight & Coke, A, Ordinary	100	257—262	+3½	4 19 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	99—104	..	3 16 11
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	260—265	..	3 15 6
80,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	126—128	..	3 18 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	180—185	..	4 1 1
1,800,000	,,	,,	7	Do. H, 7 p. c. max.	100	170—175	..	4 0 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	258—263	..	3 16 1
1,061,150	,,	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	120—123	..	3 5 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	125—130	..	3 9 8
650,000	,,	,,	6	Do. 6 p. c. do.	100	174—179	..	3 7 0
3,600,000	Stck.	14 Nov.	10	Imperial Continental	100	210—218	+1	4 13 10
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd	5	5—5¼	..	5 9 1
560,000	100	1 Oct.	5	Met.of Melbourne,5 p.c. Deb.	100	115—117	..	4 5 6
541,920	20	29 Nov.	6	Monte Video, Limited	20	18¼—19¼	..	6 3 1
150,000	5	29 Nov.	10	Oriental, Limited	5	9¼—9¾	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6¾—6¾*	..	5 8 8
166,870	10	16 Jan.	4	Pará, Limited	10	5¼—6	..	6 13 4
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	104—107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	12 Oct.	10	San Paulo, Limited	10	16½—17½	..	5 14 4
500,000	Stck.	28 Feb.	16½	South Metropolitan, A Stock	100	314—319	..	5 1 11
1,350,000	,,	,,	12½	Do. B do.	100	240—245	+2½	4 18 11
141,500	,,	,,	13½	Do. C do.	100	255—265	..	5 0 0
600,000	,,	28 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137—140	..	3 11 5
60,000	5	28 Feb.	11½	Tottenham & Edm'ntn, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
717,467	Stck.	28 Dec.	9	Chelsea, Ordinary	100	257—262	−2	3 8 8
1,720,560	Stck.	12 Oct.	7½†	East London, Ordinary	100	210—214	..	3 10 1
700,000	50	13 Dec.	9	Grand Junction.	50	122—126	..	3 11 5
708,000	Stck.	14 Feb.	10½	Kent	100	272—277	..	3 15 9
1,043,800	100	28 Dec.	9	Lambeth, 10 p. c. max.	100	258—267	..	3 10 0
406,200	100	,,	7½	Do. 7½ p. c. max.	100	199—204	..	3 13 6
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118-120*	..	3 6 8
500,000	100	14 Feb.	12½	New River, New Shares	100	350—355	−2½	3 8 4
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	100	125—128	..	3 2 6
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c.max.	100	170—175	..	3 8 6
126,500	100	,,	6	Do. 7½ p. c. do.	100	160—165	..	3 12 9
1,155,066	Stck.	,,	10	West Middlesex	100	264—269	..	3 14 4

*Ex div

† Next dividend will be at this rate.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

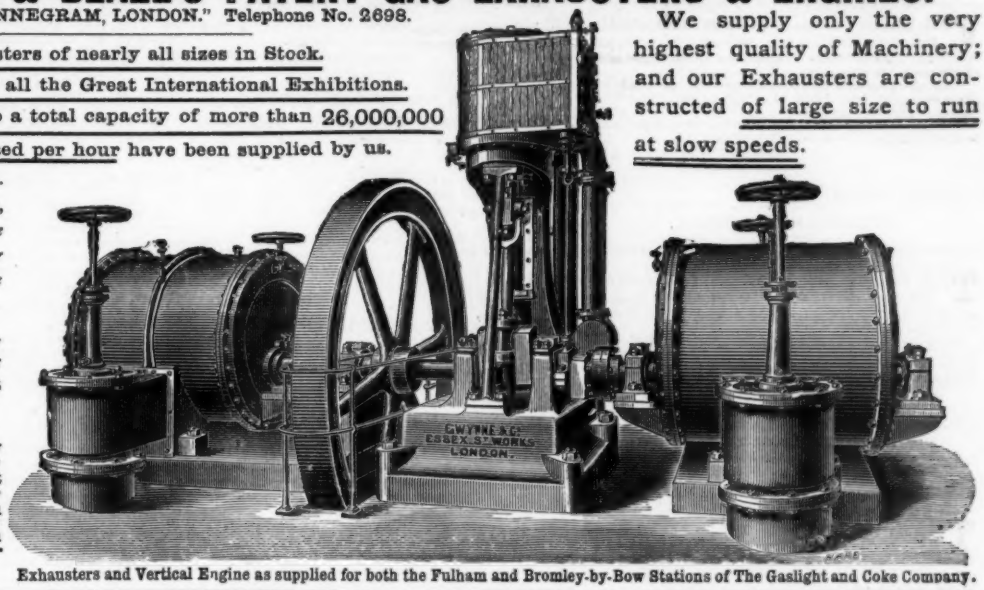
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved COTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, / No. 54, BERNARD STREET, LEITH, } SCOTLAND.

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt, Delivered in carboys or railway tank waggons.
For prices and terms address BALE, BAKER, AND CO., 120 & 121, Newgate Street LONDON.

A SITUATION Wanted, by a young Man, aged 22, Son of a Gas Manager. Able to lay Mains and Services; Fix and Repair Meters; take Meter Indices, &c. Holds a similar position. Good references.
Address No. 1690, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES, ETC.

THE Advertiser, aged 24, seeks a Situation as GAS MANAGER in small Works. Thoroughly understands Gas Making and Distribution, and everything connected with Gas-Works. Highest references and testimonials.
Address care of Mr. F. ROWE, 10, Valentia Road, BRIXTON, S.W.

WANTED, a Situation as Improver to Main and Service Laying, by a young Man, aged 20. Has had 6ix years in present Works, under the Smith. Can fix Meters, and take Meter Indices.
Apply, by letter, to No. 1691, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a thoroughly competent Sulphate of Ammonia Maker, a situation as FOREMAN or LEADING HAND. Has had sole management of Plant of large Gas-Works abroad for the past three years. Highest references.
Address ALPHA, Grasmere, Sundorne Road, Charlton, LONDON, S.E.

TO CONSULTING ENGINEERS AND GAS COMPANIES.

WANTED, a Re-engagement as Manager by a thoroughly experienced Carbonizer. The Advertiser has had large experience in General Management and Construction of the various Apparatus employed in Gas Manufacture, and at present has sole charge of a Gas-Works supplying a District and large Mills in Yorkshire. Satisfactory testimonials and references.
Apply care of MESSRS. W. C. HOLMES AND CO., Gas Engineers, &c., HUDDERSFIELD.

TIMMIS & CO., of STOURBRIDGE
Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND CO., 1, Whittington Avenue, Leadenhall Street, E.C., Sole Agents for London and District.
Telegraphic Address: "EIRWAL, LONDON."

ALEX. WRIGHT & Co., 55, 55a, and 56, MILLBANK STREET, LONDON, S.W.
[Telegraphic Address: "PRECISION LONDON."] Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gasholders and Meters, Registering and other Gauges, &c., &c.
*** See Advertisement on Page III. of the Wrapper of last week's issue.

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 604 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

SULPHURIC ACID.

HUGH WALLACE & CO., Chemical Manufacturers (the old-established firm), supply the above, which is specially adapted for making White Sulphate of Ammonia. The latter purchased in any quantities at highest market prices, or contracts for the year.
For price and terms apply Botolph House, Eastcheap, LONDON, E.C.

CHEMIST Wanted for the Continent. Thoroughly acquainted with the process of manufacturing Crystal Carbolic Acid out of Fifties and Sixties Crude, and with practical experience.
Address, with references, stating salary required, to No. 1687, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, an active Man as Stoker. Must have had some experience; and be able to lay Services and connect Meters. References required. Wages 25s. per week.
Apply, stating age, &c., to the MANAGER of the Gas-Works, LEATHERHEAD.

WANTED, by a Provincial Firm of Gas Engineers and Contractors, a MANAGING CLERK, to take charge of Office. Must have thorough knowledge of Bookkeeping, Gas-Works Construction, and the general routine of a Contractor's Business. Must not be under 30 years of age; total abstainer preferred. Must have exceptional references.
Address, stating age, qualifications, and salary required, No. 1685, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Good Second-hand LIVESEY WASHER, to pass about 100,000 feet per 24 hours; 6-inch Connection.
State price, and if any bends, to No. 1684 care of Mr King 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two Second-hand Purifiers, 10 ft. 6 in. or 12 ft. square. Also 8-inch CENTRE-VALVE.
Apply to the MANAGER of the Gas-Works, PEMBROKE DOCK.

WANTED, a large Second-hand Gas PURIFIER, for use in connection with Sulphur-Recovery Process.
Apply, by letter only, to No. 1688, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Co.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.
Highest References and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Tools, and Sundries.
*** See large Advertisement in last week's issue, page 560.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SHIPPING AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 9, Crosby Square, London, E.C., Shipping Agent to several Foreign Gas Companies, is prepared to attend to the Forwarding and Insurance of Goods for Foreign and Colonial Gas Companies, &c., and Gas Plant Manufacturers.
For Rates of Freight, apply as above.

EDWARD COCKEY & CO., LIMITED.

FOR SALE—Five £10 Shares of this Company, £9 paid up.
Apply, by letter only, to No. 1689, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Three Boiler-Tanks in first-class condition; sizes about
29 ft. 9 in. by 9 ft.
26 „ 0 „ by 9 „
23 „ 6 „ by 7 „
Several Waggon Boiler-Tanks, Two Anthracene Filter Presses, Cisterns, Two Steam-Pumps, also Ram Pumps.
Address CULPAN AND SONS, Heckmondwike, YORKSHIRE.

REDHILL GAS COMPANY.

SALE OF SHARES.

MESSRS. MOULTON, FISK, and WALKER are instructed to Sell by Auction, at the White Hart Hotel, Reigate, on Tuesday, the 16th of April, 1889, at Five for Six o'clock in the evening,
27 FULLY-PAID and 16 HALF-PAID SHARES in the REDHILL GAS COMPANY.
The Company pay good Dividends; and these Shares are offered as a desirable investment for small amounts.
Particulars and Conditions of Sale may be had at the place of Sale; of Mr. ALINGHAM, Printer, Market Place, REIGATE; Mr. S. SHELDRAKE, Warren Road, REIGATE; F. J. W. WOOD, Esq., Solicitor, Ipswich, SUFFOLK; and of the AUCTIONEERS, Woodbridge, SUFFOLK.

FOR SALE—Very cheap, Three 24-inch VALVES; Makers, Vickary and Co. Also Seven 12-inch VALVES; Makers, Willey and Co.
Apply to W. A. PADFIELD, Engineer and Secretary, Gas Offices, EXETER.

FOR SALE—A pair of Exhausters with Hydraulic Bye-Pass; at present working upon the Bingley Gas-Works. Capacity of each Exhauster 12,000 cubic feet per hour.
The above-mentioned Exhausters will be ready for disposal next June, when they will be superseded by others of greater capacity.
Tenders for the purchase of the same to be addressed to the Chairman of the Gas Committee.
By order,
GEORGE DUNBAR MALAM,
Engineer.
Bingley, March 19, 1889.

EXHIBITION AT PENRITH.

TO MAKERS OF GAS, WATER, AND SANITARY APPLIANCES.

THE Penrith Local Board have arranged to hold in Penrith, on May 8, 9, 10, and 11 next, an EXHIBITION OF GAS, WATER, and SANITARY APPLIANCES.
Applications for space, with full particulars of proposed Exhibits, should be sent to the undersigned not later than the 17th of April next. (All space for Gas Cooking and Heating Stoves already taken up.)
By order,
GEORGE WAINWRIGHT, Clerk.
Public Offices, Penrith, March 22, 1889.

CORPORATION OF LEICESTER.

(AYLESTONE ROAD WORKS.)

CAST-IRON TAR AND LIQUOR TANKS.
SECTION No. 2.—CONTRACT No. 18.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Supply and Erection of Four CAST-IRON TAR and LIQUOR TANKS, 50 feet diameter, at their Aylestone Road Works.
Drawings may be seen, and specification and form of tender obtained, upon application to the Engineer, and on payment of the sum of £5, which will be returned upon the receipt of a *bonâ fide* tender.
Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Cast-Iron Tanks," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, April 6 prox.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, C.E.,
Engineer and Manager.
Gas Offices, Millstone Lane, Leicester,
March 25, 1889.

THE Ballymena and Harryville Gaslight Company, Limited, invite TENDERS for 1300 tons BEST SCREENED GAS COAL, f.o.b. at Larne or Belfast, to be delivered before the 1st of November next.
Payment to be made on the first Monday in March, 1890.
Tenders to be lodged with me on or before Ten o'clock, on Monday, the 15th of April next.
GEORGE GREENE, Secretary.
Ballymena, March 25, 1889.

TENDERS FOR TAR AND LIQUOR.

THE Gas Committee of the Colne and Marsden Local Board are prepared to receive TENDERS for the surplus TAR and LIQUOR made at their Works for either One or Two years, commencing from April 1, 1889, to March 25, 1890.
Tenders to be addressed to the Chairman of the Gas Committee, Colne, Lancashire, on or before April 20, 1889.
The Committee do not bind themselves to accept the highest or any tender.
THOMAS VARLEY.
Gas-Works, Colne, Lancashire,
March 28, 1889.

ROCHDALE CORPORATION.

TENDERS FOR SPENT OXIDE.

THE Gas Committee of the Corporation invite TENDERS for the SPENT OXIDE produced at the Gas-Works during the ensuing Twelve months.
The quantity will be about 600 tons, 250 tons of which are now ready; the percentage of Sulphur being from 48 to 50.
Tenders, stating price per unit of Sulphur, and endorsed "Spent Oxide," must be sent to me not later than Noon of Wednesday, the 10th day of April next.
By order,
ZACH. MELLOR, Town Clerk.
Town Hall, Rochdale, March 29, 1889.

GLASGOW CORPORATION GAS.

THE Glasgow Corporation Gas Commissioners invite TENDERS for the supply of such METERS (Dry and Wet) as they may require for Twelve months, from the 1st of May, 1889.
Forms of tender may be had on application to the Manager, at the Gas Office, 42, Virginia Street, Glasgow.
Sealed offers, addressed to the Subscriber, and marked "Tender for Meters," will be received at the Gas Office, 42, Virginia Street, Glasgow, on or before Tuesday, the 9th of April, 1889.
The Commissioners do not bind themselves to accept the lowest or any tender.
J. D. MARWICK, Town Clerk.
City Chambers, Glasgow, March 19, 1889.

BOROUGH OF MACCLESFIELD.

THE Gas Committee are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve months or Two years commencing the 1st day of May next.
Tenders, for both One or Two years, to be sent in not later than Saturday, the 27th of April, 1889, addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar, &c."
For conditions apply to Mr. Moore, Engineer, Gas-Works, Macclesfield.
W. FREDK. TAYLOR, Town Clerk.
Macclesfield, March 25, 1889.

SPENT OXIDE OF IRON.

THE Great Grimsby Gas Company have on offer a quantity of SPENT OXIDE OF IRON ready for immediate delivery, which may be seen, or samples approximate in quality of the lot will be forwarded on application.
Payment, cash on delivery.
The Company will undertake to deliver free in waggons on the Great Northern Railway Company's Sidings, Great Grimsby.
Further particulars may be obtained on application to the undersigned.
The highest or any tender not of necessity accepted.
JAMES JOWETT,
Engineer and Manager.
Great Grimsby Gas-Works,
March 22, 1889.

BUCKLEY GAS COMPANY, LIMITED.

TENDERS are invited for the supply, delivery, and erection at Buckley, Flintshire, of one SINGLE-LIFT GASHOLDER, 40 feet diameter by 16 feet deep, also for other PLANT consisting of RETORT-FITTINGS, HYDRAULIC MAIN, one 6-inch PIPE CONDENSER, one SCRUBBER (8 feet diameter), two PURIFIERS (6 feet square, with lifting gear), one STATION METER, and one 6-inch GOVERNOR—with all Pipes, Connections, and Bye-Pass Valves.
Plans and specifications may be seen at the office of the undersigned, at Wrexham, to whom tenders are to be sent on or before the 17th of April, 1889.
Any further information may be had from Mr. J. H. Parsons, Gas-Works, Oswestry.
TENDERS are also invited for the supply and delivery at Buckley of CAST-IRON SOCKET AND SPIGOT PIPES—about 500 6-inch, 600 4-inch, and 650 3-inch. Weights per lineal yard not to exceed—6-inch, 85 lbs.; 4-inch, 53 lbs.; and 3-inch, 41 lbs. Railway siding on site.
The Directors do not bind themselves to accept the lowest or any tender.
W. HAWKINS TILSTON, Secretary.
7, Henblas Street, Wrexham.

C. & W. Walker,

Gasholders, —— Purifiers,
Purifying Machines.

C. O2 & Tar extracting Washers, — Scrubbers,
Sulphate and Sulphur Plants.

Retort Mouthpieces, Condensers, Lifting apparatus,
Centre and Four way Valves, — Slide valves, &c., &c.,
Wood Sieves and Tar Burners.

Addresses:— 8, Finsbury Circus, London.
Midland Works, Donnington, Salop.
Telegraphic Address.—Fortress London, or Fortress Donnington.

HARTLEPOOL GAS AND WATER COMPANY.

THE Directors of the Hartlepool Gas and Water Company are prepared to receive TENDERS for the Supply and Erection at their Works, West Hartlepool, of Two PURIFIERS, 26 feet by 16 feet, and 4 feet deep, with all necessary Valves, Connections, Girders, and Columns to support same.

Plans and specifications may be seen, copies of same obtained, with any further information, upon application to the Company's Engineer, Mr. Thomas Bower.

Tenders, sealed and endorsed "Tender for Purifiers," to be sent to the undersigned not later than Wednesday, the 10th day of April next.

The Directors do not bind themselves to accept the lowest or any tender.

THOMAS TREWHITT, Secretary.

Gas-Works, West Hartlepool,
March 26, 1889.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the AMMONIACAL LIQUOR that may be produced at their Gas-Works, York Street, Meadow Lane, and New Wortley, during a period of One, Two, or Three years, from the 1st of July next.

The quantity annually produced is approximately about One million gallons at York Street Works, about ½ million gallons at Meadow Lane Works, and about ½ million gallons at New Wortley Works.

Tenders may be for the Liquor produced at any one of the Works, or for the whole.

Forms of tender and conditions of contract may be obtained on application to Mr. Lupton, Gas Department, Municipal Offices, Leeds, and endorsed Tenders, addressed to the Chairman of the Gas Committee, at the same Address, will be received not later than Thursday, the 9th day of May next.

The Committee do not bind themselves to accept the highest or any tender.

BOROUGH OF HEYWOOD.

TO COLLIERY PROPRIETORS.

THE Committee of the Heywood Corporation are prepared to receive TENDERS (from Colliery Proprietors only) for the supply of 8000 to 10,000 tons of BEST SCREENED GAS COAL, to be delivered at Broadfield Railway Station, Heywood.

The deliveries are to be made in such quantities, and at such times, as the Gas Engineer may direct.

Full particulars and tender form can be had on application to the Engineer, Mr. H. Hawkins.

Sealed tenders, endorsed "Tender for Coal," are to be delivered at the Town Clerk's Office, addressed to the Chairman of the Gas Committee, on or before Monday, the 15th day of April, 1889.

The Committee do not bind themselves to accept the lowest or any tender; but reserve the right to accept a portion of any tender.

By order,
A. WALLIS, Town Clerk.

April 1, 1889.

CARDIFF GASLIGHT AND COKE COMPANY.

TENDERS FOR COALS.

THE Directors of the above Company are prepared to receive TENDERS for a supply of 50,000 tons of best DOUBLE-SCREENED LARGE GAS COALS, the deliveries to commence in July next, for a period of One year, and to be supplied in monthly quantities in accordance with the Specification.

A quantity of about 8000 tons will be required at the Bute Terrace Works, and about 42,000 tons at the Grangetown Works, Cardiff.

Parties tendering can do so for the whole quantity, or for quantities from 5000 tons upwards.

The Company's Grangetown Works are in direct communication with all Railway Companies and with the Penarth Docks, and well situated for receiving cargoes of Coal by steamers.

Deliveries, if by steamer, to be free into trucks at Penarth Docks, and if by rail, free into the Works at Grangetown; those for the Bute Terrace Works to be delivered at the Cardiff Station of the Great Western, Taff Vale, or Rhymney Railway.

Specification of monthly deliveries, conditions of discharging, and all other information required, can be obtained on application to Mr. H. Morley, the Company's Engineer.

The tenders must state the name and locality of the Colliery, also the particular seam from which it is proposed to supply the coal, and the price, delivered as above, accompanied if possible with a practical working analysis.

Sealed tenders to be sent to the undersigned not later than Wednesday, the 1st of May next, addressed to the Chairman of the Company, endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.

By order,
GEORGE CLARRY, Secretary.

Gas Offices, Cardiff, March 30, 1889.

PUDSEY GAS COMPANY.

THE Directors of the Pudsey Gas Company invite TENDERS for the supply of 1200 yards of 18-inch CAST-IRON PIPES, in 12-feet lengths, with plain Socket and Spigot Joints; also a quantity of IRREGULARS. Metal to be of good quality. The Pipes to be cast vertically in dry Sand with Socket downwards, coated on the outside, and tested.

Tenders, stating weight of each pipe and the price per ton, delivered at Pudsey—Lowtown Station, Great Northern Railway—to be sent to the Chairman (George Armitage, Esq.), endorsed "Tender for Cast-Iron Pipes," not later than the 8th day of April next.

The Directors do not bind themselves to accept the lowest or any tender.

JOHN WILKINSON,
Secretary and Manager.

Gas-Works, Pudsey, March 30, 1889.

BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

THE Gas Committee of the Salford Corporation are prepared to receive TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Tiles, Bricks, &c.) required for their Gas-Works during the next Twelve months.

Particulars and quantities may be obtained on application to the Engineer and Manager, Gas Offices, Bloom Street, Salford.

Tenders, endorsed "Tender for Fire-Clay Goods," addressed to the Chairman of the Gas Committee, must be delivered to me at the Town Hall, Salford, at or before Three p.m. on Thursday, the 11th of April next.

By order,
SAMUEL BROWN, Town Clerk.

Town Hall, Salford, March 25, 1889.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Invention may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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Prices:

Limp Cloth—Half Quire, 10s.; *One Quire*, 16s. *Half Bound, Cloth Sides—Two Quires*, 36s.; *Three Quires*, 44s.

TO BE HAD OF THE PROJECTOR,

EDWARD SANDELL, Chartered Accountant, No. 181, Queen Victoria Street, E.C.

OR OF

WALTER KING, "Journal of Gas Lighting," 11, Bolt Court, Fleet Street, E.C.

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ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 Inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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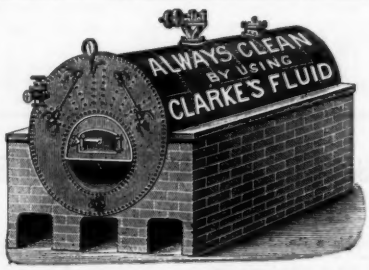

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Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
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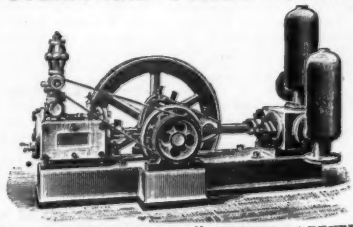

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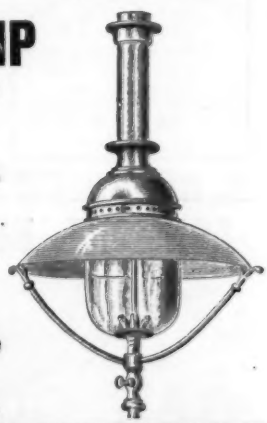

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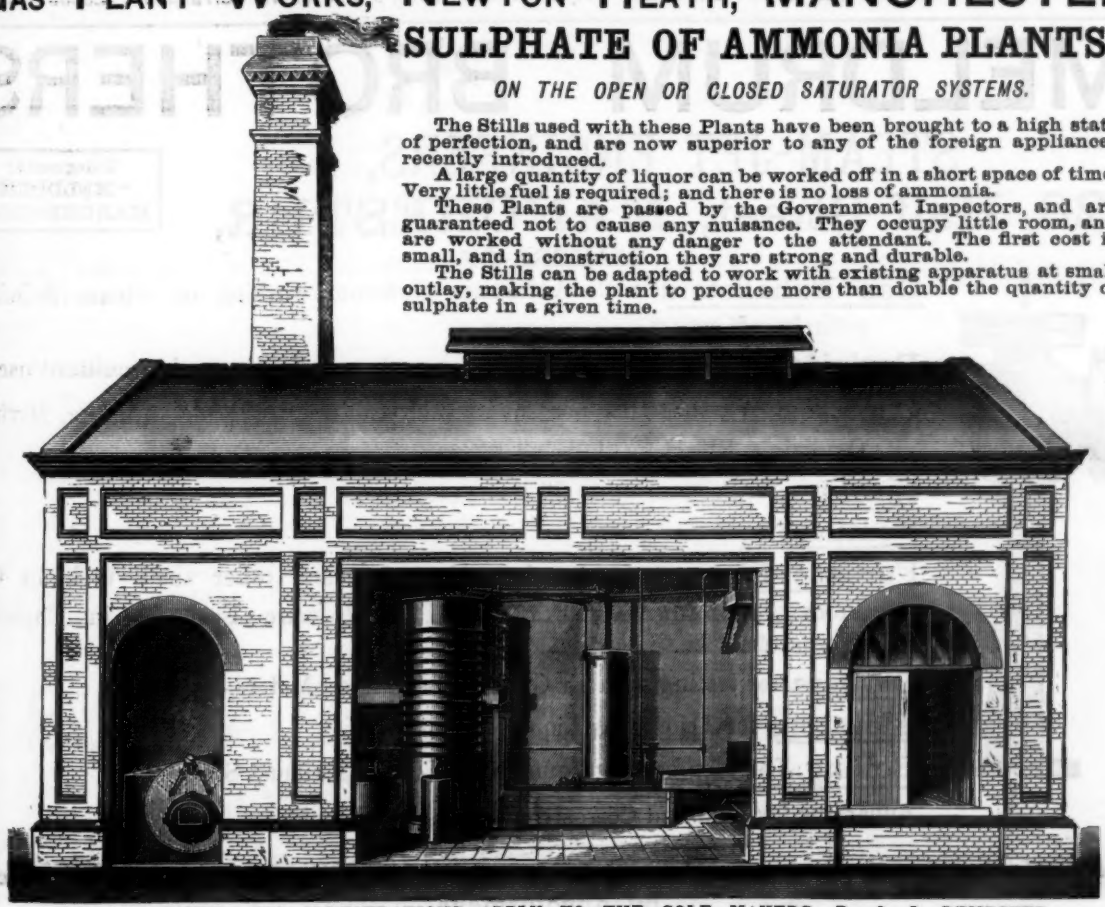

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Weight of illuminating matter in pounds of sperm, 820·80. Very free from impurities.

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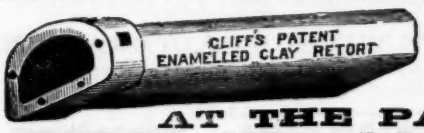

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Ejectors for vacuum up to 26 inches mercury.

Ventilators.

Furnace Blowers for burning coke refuse and other small fuel, for Gas Producers, Re-heating Furnaces, Plus Pressure Furnaces in Chemical Works, &c., &c.

Blowers for testing with air Gasholders, Station Meters, &c.

Elevators for Acids, Gas Liquor, Water, &c.

Boiling Jets for heating liquids with Live or Exhaust Steam.

Apparatus for Acid and Corrosive Vapours and Liquids.

Most of the Appliances named may be seen in operation at the above address, by appointment.

LIVESEY AND TANNER'S

PATENT

DIFFERENTIAL TAR AND LIQUOR OVERFLOWS

AND

TAR SCREEN

FOR HYDRAULIC MAINS.

This Apparatus is being successfully used at many Works; amongst others, at all the Stations of the South Metropolitan Gas Company, and at the Silvertown Works of The Gaslight and Coke Company, besides large Provincial Works.

Amongst other commendatory letters, the following have been received:—

Croydon Commercial Gas and Coke Company,
May 29, 1888.

Messrs. S. CUTLER & SONS,

GENTLEMEN,—In answer to your letter of the 26th inst., I am pleased to be able to say that I am so satisfied with the LIVESEY AND TANNER TAR OVERFLOWS which I have had in use during the past winter, that I have recommended their adoption throughout our retort-houses.

I am, yours faithfully,

J. W. HELPS.

Gas-Works, Tunbridge Wells,
May 30, 1888.

Messrs. S. CUTLER & SONS,

GENTLEMEN,—I have much pleasure in saying that LIVESEY AND TANNER'S TAR AND LIQUOR OVERFLOWS, which have been fitted to all our Hydraulic Mains, have given me complete satisfaction.

The use of New Boghead Cannel has been reduced from 2·72 per cent. to 0·10 per cent.; and at the same time the illuminating power has been increased by a quarter of a candle, when working under precisely the same conditions in other respects.

I have also adopted them in a small works, to which I consider they are equally suited, as they work freely, and require very little attention.—Yours faithfully,

ANDREW DOUGALL, Jun., Assoc. M. Inst. C.E.

Gas-Works, Tunbridge Wells,
Feb. 15, 1889.

Messrs. S. CUTLER & SONS,

GENTLEMEN,—In reply to your inquiry respecting LIVESEY AND TANNER'S TAR AND LIQUOR OVERFLOWS, I have much pleasure in saying that they continue to give every satisfaction.

A few months ago I had a very striking proof of their value. I started four Beds without the "Overflows," allowing the Tar to travel along with the Gas, when the illuminating power dropped a candle, and did not regain the loss until the "Overflows" had been put into operation. This experiment was repeated with the same result.

The apparatus requires but little attention; and if a small quantity of tar is run off regularly every morning, nothing further is required.—Yours faithfully,

ANDREW DOUGALL, Jun., Assoc. M. Inst. C.E.

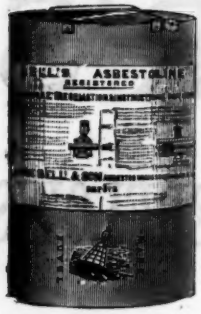
S. CUTLER & SONS,

PROVIDENCE IRON-WORKS,

MILLWALL (near Steamboat Pier), LONDON, E.

BELL'S ASBESTOLINE.

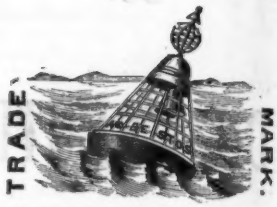
REGISTERED.



All kegs are labelled as above.

ADVANTAGES OF ASBESTOLINE.

ASBESTOLINE is the most efficient Lubricant for all bearings.
ASBESTOLINE is the cheapest Lubricant.
ASBESTOLINE saves from 50 to 90 per cent. of the Cost of Oil.
ASBESTOLINE is the Cheapest Lubricant.
ASBESTOLINE is favoured by Insurance Companies.
ASBESTOLINE is the most Inodorous Lubricant.
ASBESTOLINE is the safest Lubricant from Ignition.
ASBESTOLINE has beaten all other Lubricants in trials.
ASBESTOLINE is applicable in and out doors in every Climate.
ASBESTOLINE requires no special application.



CONSISTENCY OF ASBESTOLINE.

ASBESTOLINE, to meet all circumstances, is made in four degrees of consistency—A, B, C, and CC.

ASBESTOLINE, A, is specially adapted to ordinary Land Engines and Machinery, in and out door, in this country.

ASBESTOLINE, B, a little more solid, is for use on Steamships in temperate climates, also on land when it is desirable to have Lubricant stiffer than A.

ASBESTOLINE, C, is for use in tropical climates, both ashore and afloat. It is also invaluable in works in this country when the temperature is high.

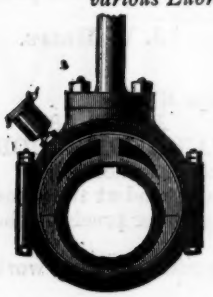
ASBESTOLINE, CC, is designed for use on Calenders, Paper-Machines, &c., where the bearings are heated by steam passing through, and sometimes is advantageously used instead of C.

The reputation of Asbestoline as a Lubricant of the highest efficiency in every kind of Machinery is established; and it has never been equalled by any other Lubricant in the numerous cases of special difficulty in which the best oils are ineffectual. It is used with marked success in Steel and Iron Works, Collieries, Cotton and Wool Mills, and other Textile Manufactories. In Corn-Mills it has proved invaluable on the roller and other modern machines. In Saw-Mills, on machines going up to 5000 revolutions per minute, its work has never been approached by any other Lubricant. On Electric Lighting Machinery, and in Steamships of all sizes throughout the world, the success of Asbestoline is unequalled. Many engines and machines of all descriptions give trouble, and show bad results both in working and wear, when the system of lubrication has not received due consideration. Engineering firms of the highest standing have given to it their powerful testimony and support.

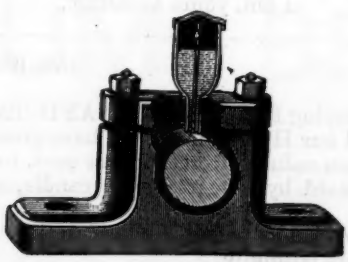
Supplied in Kegs, 28, 56, or 112 lb. Price, 2/3 per lb. Kegs Free. Special Terms for Large Quantities.

IMPORTANT TO EXPORT MERCHANTS.—*One pound of "Asbestoline" equals 2 gallons of Oil weighing 18lbs.; consequently the saving in freight is very considerable. Liberal Terms are conceded to Export Merchants.*

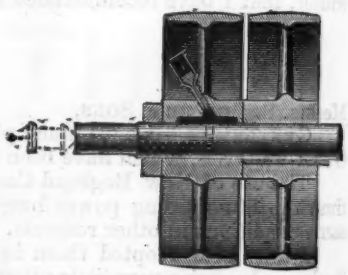
Below will be found illustrations of the mode of fixing Lubricators for Asbestoline to bearings. Full particulars of the various Lubricators supplied for Asbestoline, and the manner of fitting, in catalogue free on application.



Lubricator fitted to Eccentric of Vertical Engine



Showing Section of Lubricator fitted to ordinary Bearings.



Lubricator in different position for Loose Pulleys.

THE ATTENTION OF

ENGINEERS, AND ALL USERS OF STEAM POWER AND MACHINERY,

IS SPECIALLY INVITED TO THE FOLLOWING REPORT.

Owing to the number of Greases now offered, samples of BELL'S ASBESTOLINE were submitted to Otto Hehner, Esq., for analysis, and the subjoined Report fully proves BELL'S ASBESTOLINE to be the safest as well as the best Lubricant for all purposes:—

The Laboratory, 11, *Billiter Square, E.C., London, May* 3, 1888.

I have subjected a sample of Bell's Asbestoline taken from the stores of Messrs. J. Bell and Son, in Southwark Street, to a number of tests, in order to ascertain whether its use in Mills or Factories might contribute to the danger from Fire.

I found that Asbestoline ignites only with the greatest difficulty when brought into contact with flame; that wood and other combustible material soaked in Asbestoline burns, if anything, with greater difficulty than by itself; that its flashing point is so high that it lies beyond the range of Mercurial Thermometers; and that consequently no friction obtainable in the ordinary run of machinery is capable of developing inflammable vapours from it.

Bell's Asbestoline is as absolutely safe a Lubricant as can be desired or obtainable. In the case of fire breaking out from any cause, it does not assist the conflagration; and it is quite incapable of leading to spontaneous combustion, either by itself or in contact with inflammable material.

From the physical nature of Asbestoline its use is of necessity perfectly clean and free from waste.

(Signed) OTTO HEHNER, Public Analyst.

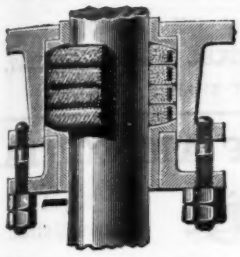
Illustrated Priced Catalogue, with numerous Testimonials by Leading Firms, free on application.

BELL'S ASBESTOS COMPANY, LIMITED,

DEPOTS—MANCHESTER: Victoria Buildings, Deansgate. LIVERPOOL: 2, Strand Street, James Street.

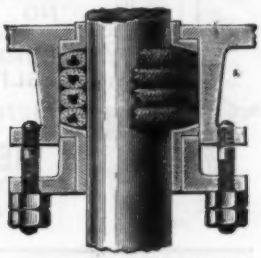
BELL'S ASBESTOS DAGGER PACKING

PATENT No. 15,498.



ROUND.

SQUARE.



Every 10 feet has Label as above, and bears our Trade Mark.

Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT, DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest type. The Packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

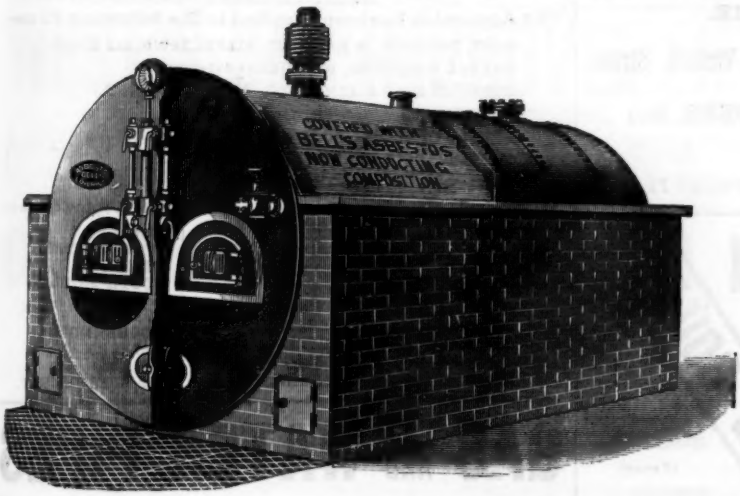
IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

Price of either Section, 5s. 6d. per lb. Steam Vulcanized, 6s. 6d. per lb.

BELL'S ASBESTOS NON-CONDUCTING COMPOSITION,

FOR COVERING BOILERS AND STEAM-PIPES,

Will reduce loss by radiation to a minimum and save 40 per cent. of fuel.



Price 25s. per Cwt.

Second Quality, 15s. per Cwt., is superior to the best sold by other Firms.

It is essential in covering that it shall not only be a non-conductor, but a substance free from whatever can injure metal, and of a nature which will enable it to adhere well for years. To do this it must be sufficiently elastic to prevent cracking and leaving, by expansion and contraction, the heated surfaces to which it is applied. This Composition is daily applied to Tanks with Round or Flat Bottoms, and its adhesive properties enable it to keep to the surfaces without bands or any device necessary for holding on other compositions. Our covering never fails to Save its Cost in a few months, lasts for years, after which it can be taken off and applied again with a little fresh. In all respects it is so superior as to be infinitely cheaper than Compositions sold at one-fourth the price. We would point out that this, being supplied dry in bag, will cover six times more surface than other materials which are sent out wet in cask. This shows the apparent low prices of other Compositions to be a sham.

For Export about one-third cost of freight is saved as compared with Compositions sent out in a wet state. In competition its never-failing efficiency has repeatedly proved it to be the cheapest material in the market for prevention of loss by radiation.

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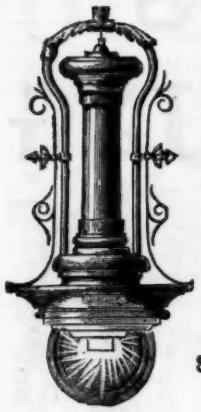
"THE METEOR."



NEW HIGH-POWER GAS-LAMP, WESTPHAL'S PATENT.
MOST INTENSE WHITE BRILLIANT GAS LIGHT.
MOST ECONOMICAL, SIMPLE, AND DURABLE.
DOES NOT GET OUT OF ORDER. RIVALS THE ELECTRIC LIGHT.
NO ALTERATION REQUIRED TO EXISTING FITTINGS.
BURNER, BEING A CIRCULAR SLIT, DOES NOT CHOKE UP.

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WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

HORSELEY COMPANY, LTD.

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GAS ENGINEERS, IRONFOUNDERS, &c.,
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SMETHWICK,
NEAR BIRMINGHAM
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IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

Gas Apparatus

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

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MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

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The most successful and approved Apparatus known up to the present time.

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Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

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WILLIAM GRICE & CO.

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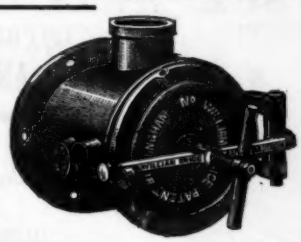
Grice's Patent Self-Sealing Mouthpieces.

To suit all sized sections of Retort. Over 70 stock sizes. Largely used in England.



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Made to suit large or small Gas-Works. The one machine draws the spent coke and recharges the Retort at one operation. Self-contained; working from engine on base or by hand. Price and particulars on application.

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MORTAR & LOAM MILLS,

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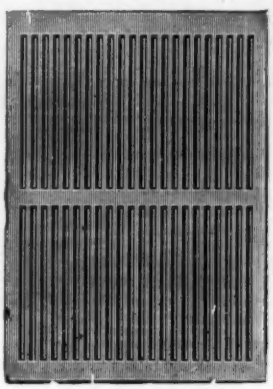

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Made from any kind of Timber, of any Size or Shape, by trained Workmen and specially-designed Machinery

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GAS PLANT WORKS,

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WEST'S GAS IMPROVEMENT CO., LIMITED,

Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

OVER **140** MACHINES AT WORK.

ADVANTAGES ATTENDING ITS USE ARE:—

INCREASED VOLUME of GAS per TON and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from 8 PENCE to 15 PENCE per Ton of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by Wire Rope, Steam, or Compressed Air.—The power machines are applicable to circular, oval, or ⌂-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made; they are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

Sole Makers of **CIRCULAR, OVAL,** or ⌂-shaped **MOUTHPIECES,** with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and at the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

N.B.—The whole of these Fittings are made of Wrought Iron.

Estimates and further particulars forwarded upon application for Mouthpieces complete, or for Lids and Fastenings separately.

MAKERS OF THOMAS AND SOMERVILLE'S COKE-BREAKING MACHINE.

SOLE MAKERS OF WHITE'S PATENT AUTOMATIC GAS-VALVE.

Mr. JOHN WEST, M. Inst. C.E., Managing Director.

ILLUSTRATED CATALOGUE SENT UPON APPLICATION.

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GLOBE METER WORKS, OLDHAM,

MANUFACTURERS OF

Design for a Station Meter to Register from 10,000 to 80,000 Cubic Feet of Gas per Hour.

GAS STATION METERS

IN RECTANGULAR CASES,

WITH PLANED JOINTS, AS FIRST INTRODUCED BY US, TO REGISTER FROM 10,000 TO 250,000 CUBIC FEET PER HOUR.

Also in CYLINDRICAL CASES

OF ALL SIZES UP TO 80,000 CUBIC FEET PER HOUR.

IMPROVED CONSUMERS'

WET AND DRY GAS-METERS

Of the very Best Quality only.

STATION, DISTRICT, & CONSUMERS' GOVERNORS,
IMPROVED STREET LAMPS,
GAUGES, GAS-MAIN TAPS, LAMP TAPS,
STEAM AND WATER TAPS,
AND OTHER APPARATUS.

HOME & FOREIGN ORDERS PROMPTLY EXECUTED.

PRICES, SPECIFICATIONS, &c., ON APPLICATION.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

PRICE AND PARTICULARS ON APPLICATION.

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RENSHAW, KING, & Co.,

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MANUFACTURERS AND ERECTORS OF GASHOLDERS AND GAS APPARATUS.

SOLE MAKERS OF RUSCOE'S PATENT SELF-SEALING RETORT LID AND FASTENER.

This Lid and Fastener is specially designed for taking up the wear and tear caused by refacing the Mouthpiece and Lid, hitherto in a large measure overlooked; and, in addition, from the special way in which the Lid is attached to the Cross-bar, the Lid has free action, and thus secures a more uniform scrape over the whole surface when being forced home by the Screw, the closing pressure being much more equally distributed than in any other form of fastening. The Lid itself is well ribbed, internally and externally; thus securing the Tightest, Strongest, and Simplest Lid in the Market, and the most easily adapted to existing Mouthpieces. The Cross-bar being of steel, it is not liable to be strained, and there is no Eccentric to wear and become inoperative.

"In answer to your inquiry as to Ruscoe's Patent Retort-Lids, we beg to say that we have used them in several works, and are thoroughly satisfied with their action. We consider they are the best in the market.—G. W. STEVENSON & SON."

MADE FOR ROUND, OVAL, AND D-RETORTS TO ANY REQUIRED DIMENSION. PRICE, WITH STEEL BAR AND CATCH COMPLETE, FOR 14-INCH DIAMETER MOUTH, £1 5s. OTHER SIZES IN PROPORTION.

LONDON OFFICE: FOUNDERS' HALL, 13, ST. SWITHIN'S LANE, E.C.

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, April 2, 1889.